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FINAL REPORT
ON
PROTOTYPE WASH WATER RENOVATION SYSTEM INTEGRATION WITH
GOVERNMENT-FURNISHED WASH FIXTURE

Contract NAS 9-17004

DRL ITEM 3

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GOVERNMENT-FURNISHED WASH FIXTURE Final
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TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION.	1
2.0 OBJECTIVES AND SCOPE.	2
Conclusions	2
3.0 TASKS LISTING	3
Task 3.1 - Analysis of Typical Product Water.	4
Appendix for Task 3.1	22
Task 3.2 - Modification of Cleanser	11
Task 3.3 - Conduct Extended Testing	12
3.3.1 Generation of Trace Organics and Evaluation of GFE Microbial Check Valve.	14
3.3.2 Problems Encountered during Extended Test Program/ Mission Simulation	19
Task 3.4 - Evaluate GFE Microbial Check Valve	20
APPENDIX.	50
DISTRIBUTION LIST	A-36

LIST OF FIGURES

		<u>Page</u>
FIGURE 7	PWWRS/SUHCF MAJOR COMPONENTS FRONT VIEW.	A-2
FIGURE 7A	PWWRS/SUHCF RIGHT SIDE VIEW.	A-3
FIGURE 8	PWWRS/SUHCF LEFT SIDE VIEW	A-4
FIGURE 9	CONTROL COMPONENTS.	A-6
FIGURE 9A	SUHCF WIRING DIAGRAM INTEGRATED WITH PWWRS	A-8
FIGURE 10	AIR SUPPLY SYSTEM	A-9
FIGURE 11	SOAP AND FeCl_3 SYSTEM	A-11
FIGURE 12	WATER SUPPLY SYSTEM	A-13
FIGURE 13	MIXING SYSTEM	A-15
FIGURE 14	WASTE WATER SYSTEM.	A-17
FIGURE 15	FILTER SYSTEM	A-19
FIGURE 16	WIRING DIAGRAM.	A-21
FIGURE 17	WIRING DIAGRAM.	A-22
FIGURE 18	MIXING TANK	A-23
FIGURE 19	WASTE TANK.	A-24
FIGURE 20	PROTOTYPE PWWRS/SUHCF FRAME.	A-25
FIGURE 21	DEMONSTRATION HAND WASHING PWWRS/SUHCF PROTOTYPE . . .	A-26
FIGURE 22	PWWRS/SUHCF RECHARGING SYSTEM.	A-27
FIGURE 23	REAR VIEW PWWRS/SUHCF.	A-28
FIGURE 24	CP162 CHASSIS	A-29

1.0 INTRODUCTION

The requirements of a significant quantity of proposed Life Sciences experiments in Shuttle payloads for available wash water to support cleansing operations, has provided the incentive to develop a technique for wash water renovation.

This effort is directed to provide a prototype wash water waste renovation system which has the capability to process the waste water and return it to a state adequate for reuse in a typical cleansing fixture designed to support Life Science experiments. The resulting technology will also support other development efforts pertaining to water reclamation by serving as a pretreatment step for subsequent reclamation procedures.

Previous efforts have resulted in the development of a breadboard system (NAS 9-15369), a preliminary prototype system (NAS 9-15931), and integration of the prototype system with a Government supplied cleansing fixture (NAS 9-15601)^a. This effort has addressed some problems encountered in the previous effort, provided for additional testing of this unit and provided for examination of the product water to identify the source of approximately 45 to 77 ppm organics that were not removed by the adsorbers. It also provided for evaluation of a GFE microbial check valve installed in the product water line.

- a. The Appendix of this report contains some diagrams and photos of the PWWWRS previously presented in the Final Report (NAS 9-16501) for ready reference.

2.0 OBJECTIVES AND SCOPE

The objectives of the proposed program were aimed at optimizing the performance of the PWWWRS through:

- Identifying trace organic material(s) in the product water which is not being removed by the adsorbers, and reformulating the soap so as to avoid this component(s) which resists removal,
- Conducting extended testing of the prototype system, evaluating the reliability of system components, and correcting any mechanical or electrical problems which may arise, and
- Evaluating the ability of the GFE microbial check valve to eliminate or minimize the presence of microorganisms in the product water.

CONCLUSIONS

1. The impurities found in treated wash water were mainly EDTA salt with trace quantities of lactic acid and lanolin.
2. The SB-40 cleanser can be modified to eliminate the EDTA salt. Rochester Germicide Company Sales Executive has stated they are willing to modify the formulation deleting the EDTA ingredient for this application.
3. Extended testing has revealed certain components that were failure prone. Components such as a bladder, and valves have been replaced. Corrective design was incorporated to eliminate reoccurrence of the failures.
4. The GFE microbial check valve was installed in the product water line and proved to be effective in reducing microorganisms to less than 2 per milliliter.

3.0 TASKS

The tasks reported are:

- 3.1 Analysis of Typical Product Water
- 3.2 Modification of Cleanser
- 3.3 Conduct Extended Testing
- 3.4 Evaluate the GFE Microbial Check Valve

TASK 3.1 ANALYSIS OF TYPICAL PRODUCT WATER

TABLE OF CONTENTS

	<u>Page</u>
3.1.1 INTRODUCTION.	5
3.1.2 ANALYTICAL METHODS USED	6
3.1.3 RESULTS	7
3.1.4 CONCLUSION.	10
3.1.5 TABLE OF FIGURES.	23

3.1 ANALYSIS OF TYPICAL PRODUCT WATER

3.1.1 INTRODUCTION

The objective of this analytical study was to detect and identify residual organics in one typical product water sample. Previous analyses¹ indicated that trace quantities of some organic compound(s) were not being removed by the absorber and ion exchanger of the waste water renovation system.

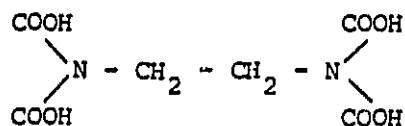
This analytical task was completed with a thorough search for impurities and their identification in one typical water sample (treatment cycle #18²). A second sample (treatment cycle #19³) was only examined for total organic carbon and carbonyl content.

The analytical task was performed in two steps.

Step 1 - Development of analytical methods for organic candidates used in soap formulation. The potential residual impurities are:

- o Fragrance - chemical composition not given. Our preliminary analytical GCMS analyses detected a series of cyclic and aromatic isomers.
- o Ethylenediamine Tetraacetic Acid (EDTA)

Chemical Formula:



Molecular Weight: 292

Solubility: Water (at 150°C, decarboxylation)

- o Lanolin

Chemical structure: Wax, mixture of esters and polyesters of 33 high molecular weight alcohols - contains also 25-30% H₂O.

Solubility: Insoluble in water; soluble in CHCl₃, ether, benzene, acetone, and CS₂.

-
1. See Paragraph 3.1 of the SOW, Exhibit A, Task 1: Conduct Analysis of Trace Residual Organics not Removed by the Adsorbers from Renovated Wash Water.
 2. Water sample from treatment cycle #18 analyzed for organics and inorganics after absorber and ion exchange treatments.
 3. Water sample analyzed for Total Organic Carbon (TOC) and carbonyl (soap) after each cleanup step.

- o Dye - Chemical formula not available.

- o Glycerol (Trihydroxypropane)

Chemical Formula: $\text{CH}_2\text{OHCHOHCH}_2\text{OH}$

Molecular Weight: 92.09

Solubility: Water, and alcohols; insoluble in CHCl_3 , benzene, and petroleum ether.

- o Lactic Acid

Chemical Formula: α -hydroxypropionic acid, $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$

Molecular Weight: 90.08

- o Urea (carbamide) $\text{NH}_2\text{-CO-NH}_2$

Molecular Weight: 60

The analytical methods development in step 1 are presented in the "Appendix for Task 3" at the end of the report.

The analytical approach developed in step 1 was then applied and/or expanded for actual analysis of residues in a wash water sample (step 2) which is the subject of this report.

3.1.2 ANALYTICAL METHODS USED

A total of 8 instrumental analytical methods¹ were utilized for analyses of water residues:

1. Gas Chromatography - Mass Spectrometry (GCMS)
2. Purge and Trap GCMS (P+T - GCMS)
3. Direct Insertion Probe - Mass Spectrometry (DIP-MS)
4. Fourier Transform Infrared Spectroscopy (FTIR)
5. Ultraviolet - Visible Spectroscopy (UV/VIS)
6. Atomic Absorption Spectroscopy (AA)
7. Pyrolysis - GCMS (Pyr-GCMS)
8. Total Organic Carbon Analyzer (TOC)

1. In addition to wet analytical methods (e.g. silylation, sample preparation, etc.)

3.1.3 RESULTS

All analytical methods indicated above were utilized for analysis of residual components, organic and inorganic, in the water samples.

Samples for Analysis

- One typical water sample (700 ml from treatment cycle #18, stored in a glass jar covered with an aluminum lined lid) was received on 7/22/84 for all additional analyses, as described in the following section.

- One typical water sample from treatment cycle #19 was used for TOC and carbonyl group analyses after each purification step.

Analytical Flowchart for Residues in Water from Treatment Cycle #18

A search for individual impurities in one water sample was performed as shown in the following diagram on page 4.

Total Organic Carbon and Carbonyl Groups in Wash Water after Treatment Cycle #19

The total profile of water impurities, analyzed for carbonyl groups and TOC, after passing through adsorber and ion exchanger, are summarized in Table I.

TABLE I

A TYPICAL WATER SAMPLE ANALYZED FOR TOC
AND CARBONYL GROUPS AFTER PASSING THROUGH
TWO PURIFYING STAGES - ADSORBER AND ION EXCHANGER

<u>Wash Water Treatment Cycle</u>	<u>Water Sampled After Adsorber</u>				<u>After Ion Exchanger</u>	
	<u>Soap, ppm⁽¹⁾</u>	<u>Soap⁽²⁾ TOC</u>	<u>Total⁽³⁾ TOC</u>	<u>Non- Soap TOC</u>	<u>Soap, ppm</u>	<u>TOC</u>
194	5-8	4-6	23-24	17-20	0-1	11-12

(1) by CCl₄ extraction/IR for carbonyl (5.75μ)

(2) calculated from soap analysis (based on Palmitic acid)

(3) York Research Laboratories, Inc., Monroe, Connecticut

(4) sample #18 is expected to have a similar profile

WATER FROM CYCLE #18
(AFTER ABSORBER AND ION EXCHANGER)

1.	2.	3.	4.	5.	6.
<u>Ash Analysis</u> <u>Metal Analysis</u>	<u>Purge and Trap GC/MS</u>	<u>Derivatization-</u> <u>GC/MS</u>	<u>Thermolysis DIP-MS</u>	<u>UV/VIS/FTIR</u>	<u>Pyrolysis GC/MS</u>
(Atomic Absorption)	Analysis for <u>Fragrance</u>	<u>Glycerol</u> <u>Lactic Acid</u> <u>EDTA</u>	Analysis for long aliphatic fragments from soap (oleic acid, lanolin, etc.), <u>urea</u> and other higher molecular fragments	UV/VIS: Analysis for traces of <u>dye</u> FTIR: Analysis for <u>organics</u>	Analysis for higher Organic <u>fragments</u>

Analysis of Residues in Wash Water after Treatment Cycle #18

The analytical method development in Phase 1 of this study was focused on detection of potential impurities used in soap. When analyzing an actual water sample, some unanticipated impurities were encountered during the search for "potential residues" (see section 3.1.1 on pages 5 and 6.

The analytical results obtained from the water sample analyses are summarized in Table II.

TABLE II
SUMMARY OF RESULTS OBTAINED FROM ONE
WATER SAMPLE (TREATMENT CYCLE #18), AFTER
PASSING THROUGH TWO CLEANING STEPS - ABSORPTION AND
ION EXCHANGER

Components Analyzed	Concentration Found	Method Used	Comments
Inorganics Total:	.24 ppm	Ash	
K	1 ppm	AA	(AA - atomic absorption)
Na	0.5 ppm	AA	
Ca	0.2 ppm	AA	
Si (a siloxane)	+	GCMS	(+=found but not quantified) (GCMS = gas chromatography - mass spectrometry)
Organics Total:	69 ppm ¹		Residue at 105°C (minus ash, presence of some H ₂ O in the residue cannot be excluded)
o Fragrance	not detected (i.e. <0.5 ppm)	P+T GCMS	See Fig. 1a - 1d
o Ethylenediamine Tetraacetic Acid (EDTA) - acidic form	not found	GCMS FTIR	Derivatization
EDTA - salt	approx. > 50 ppm ²	FTIR	See Fig. 2a - 2d

1. In Contract NAS 9-16501, the organics content ranged between 50 and 165 ppm before passing through absorbers.

2. Complexing metal(s) not known.

Table II - Continued

Components Analyzed	Concentration Found	Method Used	Comments
o Lanolin	+	DIP-MS	Presence of higher aliphatic alcohols (C ₂₉ , C ₃₂) indicated by mass spectral search, see Fig. 3a - 3h.
o Dye	not found	UV-VIS	No UV/VIS maximum detected
o Glycerol	not found (i.e. <1 ppm)	GCMS	After silylation
o Lactic Acid	<20	DIP-MS	See Fig. 4
o Urea	not found (i.e. <10 ppm)	DIP-MS	See Fig. 5
Additional organics found:			
Two phthalates	+	DIP-MS	See Fig. 6a - 6e
Methylene Chloride	>1 ppm	P+T - GCMS	See Fig. 1a, probably not from washing cycle, but from atmosphere in lab and/or refrigerator
Dimethoxy Propanol	traces ¹	P+T - GCMS	
An Ether	traces ¹	P+T - GCMS	
Higher aliphatic mass fragments	+	DIP-MS	Mostly from lanolin wax, see Fig. 3, 6
Water Insoluble Residue	beige pre-cipitate	FTIR	See Fig. 2d (probably from ion exchange resin)

1. <1 ppm

3.1.4. CONCLUSION

The main organic impurity in the treated wash water sample was identified as EDTA salt. Trace quantities of lactic acid and lanolin were also indicated.

3.2 MODIFICATION OF CLEANSER - ROCHESTER GERMICIDE

The analysis of residual organics in typical product water revealed that the main impurity in the treated wash water sample was identified as EDTA^(a) salt. Trace quantities of lactic acid and lanolin were also found. The EDTA is used as a sequestering agent for calcium usually found in hard water. Removing this ingredient from the soap formula SB-40 by Rochester Germicide is no problem. Without the use of EDTA in the cleanser, the water would be cloudy if calcium were present. The ion exchange resin in the system is designed to remove metals from the stream, therefore, calcium is not expected to be present in the product water.

The system has allowed less than 20 ppm of lactic acid and less than 1 ppm of lanolin and phthalates to pass into the product water. The lactic acid, and ingredient in the spiked water, simulates a component of body fluids from the skin.

The Rochester Germicide Company is willing to provide a modified formulation of SB-40 cleanser deleting the EDTA and lanolin ingredients for this application.

(a) EDTA - Ethylene diamine tetraacetic acid

3.3 CONDUCT EXTENDED TESTING

Preparation

The system having been dormant for several months prior to this program, required preparation for the test series.

Routine Maintenance

Filter elements were discarded and the tanks in the system were back flushed with clean water. New filter elements, new ion exchange resin and new activated carbon were installed in the system.

Corrective Maintenance

The waste tank was removed to inspect the bladder. A pin hole was found in the top seam. A new bladder was installed. The steel tank walls showed signs of corrosion where epoxy coating had peeled. The walls were scoured by sand blasting and the tank walls were recoated with epoxy. The jet agitator was incrustated with flocked material. The surface was cleaned, however, no impairment of function was indicated as the result of the accumulation.

The SUHCF control system supplied by the Government was rewired to work more directly with the PWWRS system, eliminating one panel of relays.

The dispensing valve system was disassembled to clean the valve seats which had accumulations of soap.

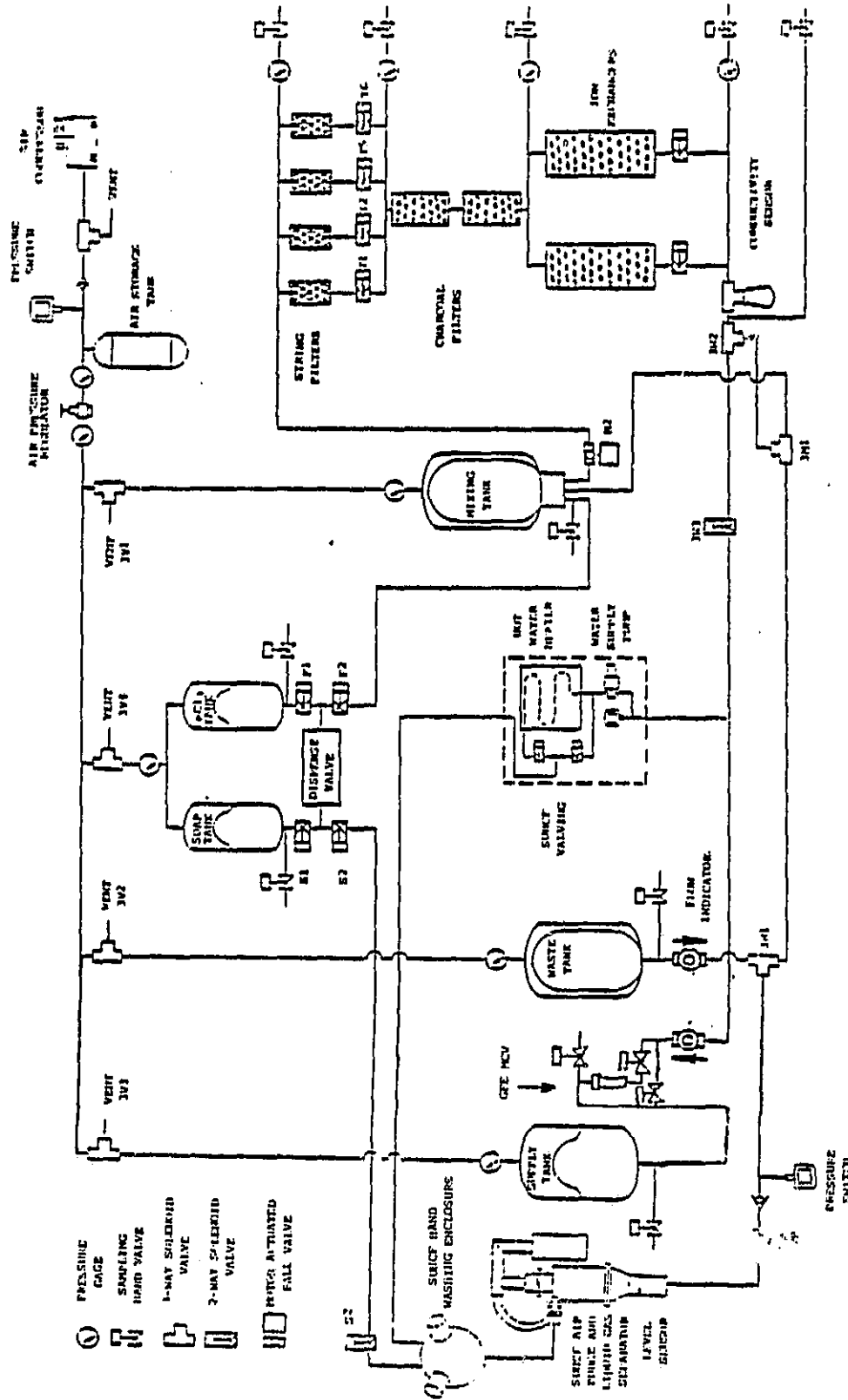
The microbial check valve GFE80508 was installed in the discharge water line leading to the water supply tank as shown on Flow Diagram Figure 7 on the following page.

A by-pass line with valves provided access for taking water samples before and after the MCV.

Start-Up Procedure

The procedure for loading the system and starting the system was reviewed and revised to conform to changes in the control wiring system. The maintenance manual is revised to include the new version procedure.

OF P... 15



FLOW DIAGRAM PWWRS/SUICF SYSTEM
WITH GFE MICROBIAL CHECK VALVE

FIGURE 7

3.3.1 GENERATION OF TRACE ORGANICS AND EVALUATION OF THE GFE MICROBIAL CHECK VALVE

The analysis of the GFE Microbial Check Valve to the Prototype Wash Water Waste Renovation System was completed, as discussed in Task 3.4. An extended test program/mission simulation was conducted. In addition to producing reclaimed water within the tentative wash water standards per Table III, there were two major objectives of this extended test program.

1. To regenerate the organics found in the previous effort which were not removed by the adsorbers for analysis.
2. To evaluate the operation of the system with the GFE Microbial Check Valve installed in the product water line.

The extended operation of the system was scheduled during which data on water use and pressure drop were monitored. The final product water was analyzed midway and upon completion of the mission simulation. The analysis included soap content, conductivity, resistivity, pH, total organic carbon and number of microorganisms per cubic centimeter.

The water, spiked with trace amounts of salts, glucose, urea and lactic acid, Table IV, was poured into the hand cleansing bowl along with soap. Ferric chloride was automatically dispensed to the mix chamber during each cycle. The extended test program involved (19) nineteen treatment cycles with a total quantity of 57 gallons (215.76 liters) of water passing through the system. The system was a closed loop except for the addition of contaminants described previously.

The test program was conducted until enough residual organics were generated, that were not removed by the adsorbers, for analysis. Assuming 0.4 lbs of water per wash and 20 washes per day, the extended test program was equivalent to a 57 day mission simulation.

The procedure followed during the test was as follows:

1. The supply tank was charged with 7 gallons of distilled water, pH 5.9.
2. The soap tank was charged with 1 gallon of soap solution, pH 10.1 (15% SB-40).

3. The ferric chloride tank was charged with 1 gallon of FeCl_3 solution, pH 3.0 (3.60% FeCl_3).
4. Water from the supply tank was discharged to fill a 1/2 gallon jar 4.17 lbs water - allowing approximately ten 0.4 pound washes.
5. Ten shots of soap solution (2 ml nominal/shot) were collected in a jar at the soap nozzle and added to the 1/2 gallon water.
6. Ten shots of FeCl_3 solution (2 ml nominal/shot) dispensed concurrently with the soap by the dispenser valve were automatically fed to the mixing chamber in normal operation.
7. The 1/2 gallon of soap-water mix was spiked by the addition of 4 mls of a mixed salt masterbatch solution.
8. The spiked, soap water mix was poured into the wash basin, drained into the air/water separator sump and transferred to the waste tank.
9. This process was repeated until 3 gallons were in the waste tank.
10. At this point in the test, the unit was switched to treatment/transfer mode and the 3 gallons were transferred to the mixing tank.
11. After a 5-minute delay for flocculation to occur, the mixture in the mixing tank was run through the filter system back to the supply tank.
12. The above process was repeated for the duration of the extended test program until a total of 54 gallons had been processed through the unit.
13. The final 3 gallons of water processed, 57 gallons total, was passed through the GFE Microbial Check Valve while in route to the supply tank.
14. During the course of the extended test program, some of the original 7 gallons of supply water was lost either as retained samples or during filter cartridge replacement, (T5 filter) and ion exchange replacement (T3) prior to treatment cycles 17 and 15 respectively.

The results of the extended test program are tabulated in Table V.

TABLE III

TENTATIVE WASH WATER STANDARDS

Total Organic Carbon (TOC), MG/L	200
Specific Conductivity, UMHO-CM ⁻¹	2000
pH	5 to 7.5
Ammonia, Mg/L	5
Turbidity, ppm SiO ₂	10
Color, PT-C Units	15
Foaming	Nonpersistent more than 15 sec.
Odor	Nonobjectionable
Total Dissolved Solids (TDS), Mg/L	1500
Urea, Mg/L	50
Lactic Acid, Mg/L	Reference Only
NACL, Mg/L	1000
Microorganisms, Number per ML	0

TABLE IV

SYNTHETIC WASH WATER FORMULATION

<u>Materials</u>	<u>Concentration (ppm)</u>
<u>Premixed</u>	
Sodium Chloride	50.00
Sodium Sulfate	30.00
Copper Sulfate	2.50
Potassium Chloride	15.00
Zinc Chloride	7.50
Glucose	1.40
Lactic Acid	7.00
Urea	10.00
<u>Dispensed</u>	
Soap (solids)	as dispensed by the PWWWS
Total	<u>123.40 ppm</u>

TABLE V
PERFORMANCE OF FWWWS DURING EXTENDED OPERATION
WITH MICROBIAL CHECK VALVE

Treatment Cycle	Gallons of Water Treated	Cumulative Gallons of Water Treated	Psig Waste Tank	Filters & Absorbers in Use	P, psig		Soap Content of Water	Water Analysis of Final Product Water				Microorganisms per C.C.	
								Across Filters	Across Defolizer	Salt Content of Water			
					Conductivity Micro mhos ca-1	Resistivity ohm-cm				pH	TOC ppm	Before NCV	After NCV
													ppm
1	3	3	30	T ₂ T ₃	0	0							
2	3	6	30	T ₂ T ₃	3	0							
3	3	9	30	T ₂ T ₃	26	1							
4	3	12	30	T ₂ T ₃	20	1							
5	3	15	30	T ₂ T ₃	20	2							
6	3	18	30	T ₂ T ₃	24	2							
7	3	21	30	T ₂ T ₃	12	2							
8	3	24	30	T ₁ T ₄	20	2							
9	3	27	30	T ₁ T ₄	18	2	<1	7.93	126,237	4	6.5	9.4	
10	3	30	30	T ₁ T ₄	19	2							
11	3	33	30	T ₁ T ₄	21	3							
12	3	36	30	T ₅ T ₄	9	2							
13	3	39	30	T ₅ T ₄	19	2							
14	3	42	30	T ₅ T ₄	21	2							
15	3	45	30	T ₅ T ₅ (1)		1							
16	3	48	30	T ₆ T ₃	20	1							
17	3	51	30	T ₅ (2) T ₃	8	1							
18	3	54	30	T ₅ T ₃	10	1							
19	3	57	30	T ₅ T ₃	10	1	<1	1.16	115,666	<2	6.1	11.5	2

(1) New ion exchange resin in defolizer T₄

(2) New filter in T₅

3.3.2 PROBLEMS ENCOUNTERED DURING EXTENDED TEST PROGRAM/MISSION SIMULATION

Two problems were observed and remedied during the extended test program which were not observed in previous testing programs.

1. Unbalanced delivery of soap and FeCl_3 . This problem was the result of an accumulation of buildup on the solenoid valve seats in the soap and FeCl_3 lines. The problem was remedied by cleaning and reassembly of the valve seats.
2. Lot to lot variations of the SB-40 soap. This problem was observed prior to the extended test program. A one gallon sample of SB-40 soap was obtained for use in the test program. Prior to mission simulation, the soap and FeCl_3 stoichiometry were routinely checked before addition to the Prototype Wash Water Waste Renovation System. This lot of soap required additional FeCl_3 than observed in past experiments for optimum soap removal.

Three additional soap samples were obtained from Rochester Germicide, each from a different production lot. The samples were tested for soap and FeCl_3 stoichiometry. Two lots were similar to past experiments while one lot required a significantly greater amount of FeCl_3 .

In order to insure complete soap removal by the Prototype Wash Water Waste Renovation System, a stoichiometry check must be made prior to the addition of soap and FeCl_3 to the tanks. The FeCl_3 concentrations can be adjusted to give the proper stoichiometry on an equal volume basis.

3.4 EVALUATE THE ABILITY OF THE GFE MICROBIAL CHECK VALVE TO ELIMINATE OR MINIMIZE MICROORGANISMS IN THE PRODUCT WATER

The GFE Microbial Check Valve 80508 was installed in the product water line after the conductivity check valve in route to the supply tank. This location is advantageous because only final product water exhibiting low enough conductivity for reuse will be allowed to pass through the microbial check valve.

Sampling stations are provided, both before and after the microbial check valve, along with an alternate microbial check valve by-pass route back to the supply tank. Water samples for microorganism counts were obtained at these stations.

Mission simulation consisted of 19 treatment cycles^a. Treatments 1-18 recycled 54 gallons of wash water, doped with 2160 cc of 15 percent SB-40 soap and trace amounts of salts. These 18 treatments bypassed the microbial check valve and were routed directly to the supply tank.

Treatment 19 evaluated the effectiveness of the microbial check valve. As in the previous treatments, 3 gallons of supply water was doped with 120cc of SB-40 soap and trace salts. This treatment routed the final product water through the microbial check valve, then back to the supply tank. Water samples for microorganism counts were drained at the sampling stations before, and after the microbial check valve.

The water samples obtained at the sampling stations were examined for number of microorganisms per milliliter of final product water. Standard methods were employed for the microbial count as published in "Standard Methods for the Examination of Water and Wastewater", Twelfth Edition, 1965. Our experimental procedure is known as Standard Plate Count.

Standard Plate Count consists of setting up a series of known dillutions of the water in question. Known volumes of these dillutions are added to petri dishes along with 10-15 mls of liquified standard plate count agar. The agar and water is mixed thoroughly together, then allowed to solidify. After solidification, the petri dishes are inverted and incubated for 48 hours at 20°C.

a. Refer to Table V page 18

After incubation, plates containing 30-300 colonies are selected for direct counting. All colonies are counted using sufficient magnification so they may be located. These numbers are then adjusted according to dilutions made in preparation.

The direct counting reveals the effectiveness of the microbial check valve. Water sampled before entry into the microbial check valve contained 320 microorganisms per milliliter of product water, while water exiting the valve contained less than 2 microorganisms per milliliter. Our experiment proves the microbial check valve greater than 99.4 percent efficient.

APPENDIX

FOR TASK 3.1

3.1.5. TABLE OF FIGURES

Figure Number	Description
1a	Total Ion Chromatograms (TIC) of water sample (#18) and blank
1b	TIC and extracted ions (at m/z 91 and 93) for water spiked with 0.5 ppm of fragrance and actual water sample after treatment cycle #18
1c	An example of a mass spectrum (MS1) taken at retention time (tr) 6.2 min and its library spectral search
1d	An example of a mass spectrum (MS2) taken at tr 9.0 min and its library spectral search
2a	An FTIR spectrum of water residue obtained after evaporation at 105°C/1 hr (acetone/nitrile solubles)
2b, c	FTIR library spectra of EDTA salts
2d	An FTIR spectrum of water soluble residue
2e	An FTIR spectrum of water insoluble beige residue (contains EDTA salt and probably ion exchange resin). Water sample contained microspheric particles.
3a	(Upper): DIP-MS-TIC profile of water residue (Lower): MS1, mass spectrum at 4.9 min of thermolytic MS run
3b	Upper: MS1 continued Lower: MS2 spectrum taken at 10.1 min
3c	Upper: MS2 continued Lower: Spectral library search* for MS2
3d	Upper: Mass spectral search* continued Lower: MS3 spectrum taken at 16.3 min.
3e	Upper: MS3 spectrum continued Lower: Spectral library search* for MS3 (see higher matches for higher aliphatics and/or alcohols)
3f	Spectral library search* for MS3 spectrum continued

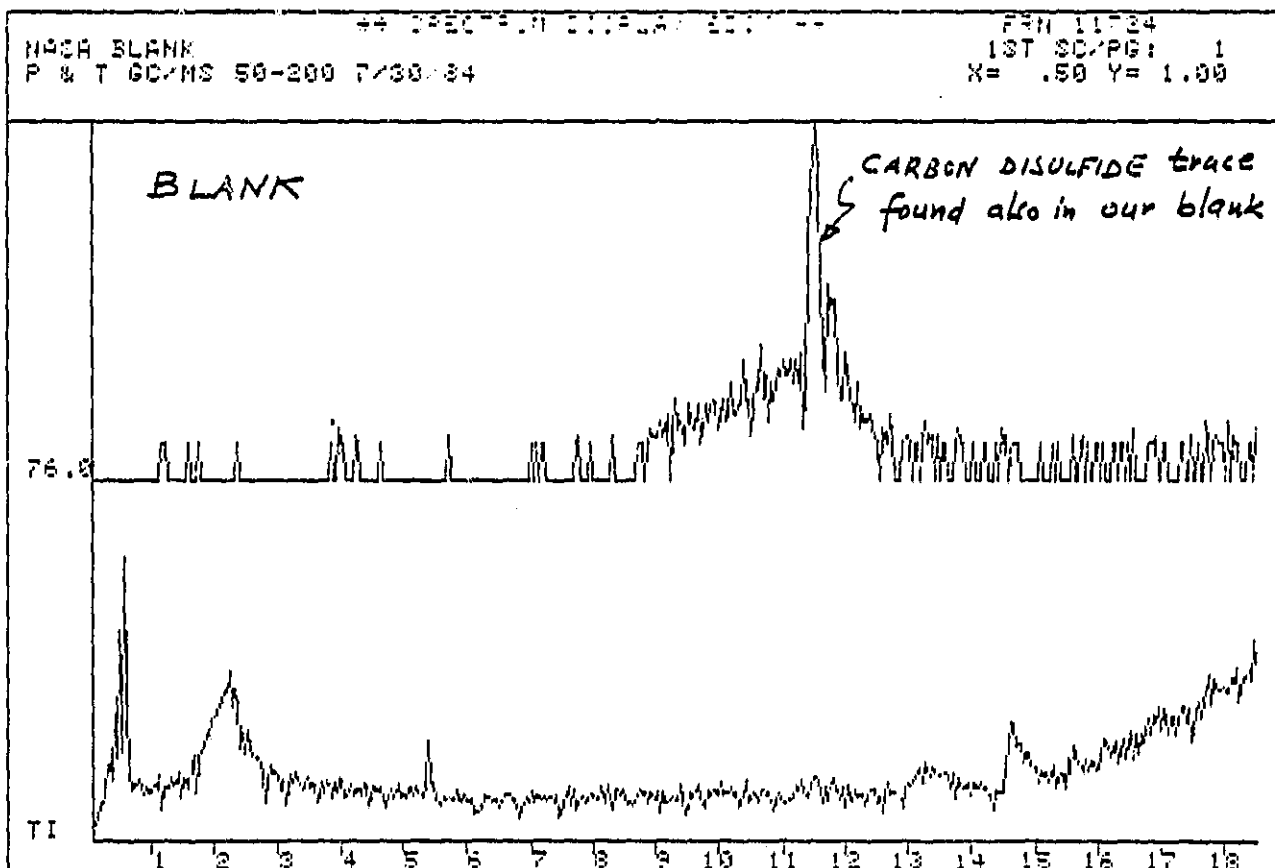
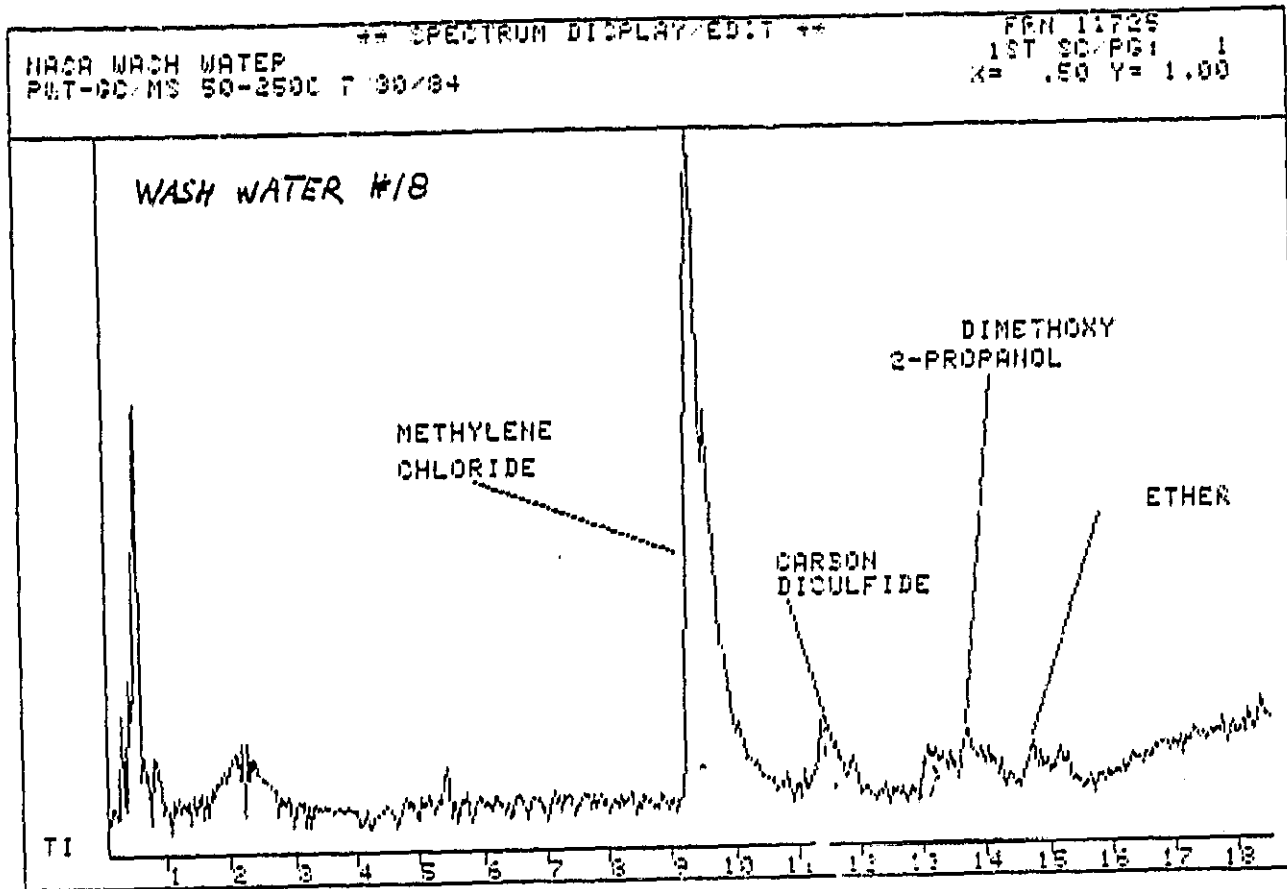
* no direct matches with our library search were found

Figure
Number

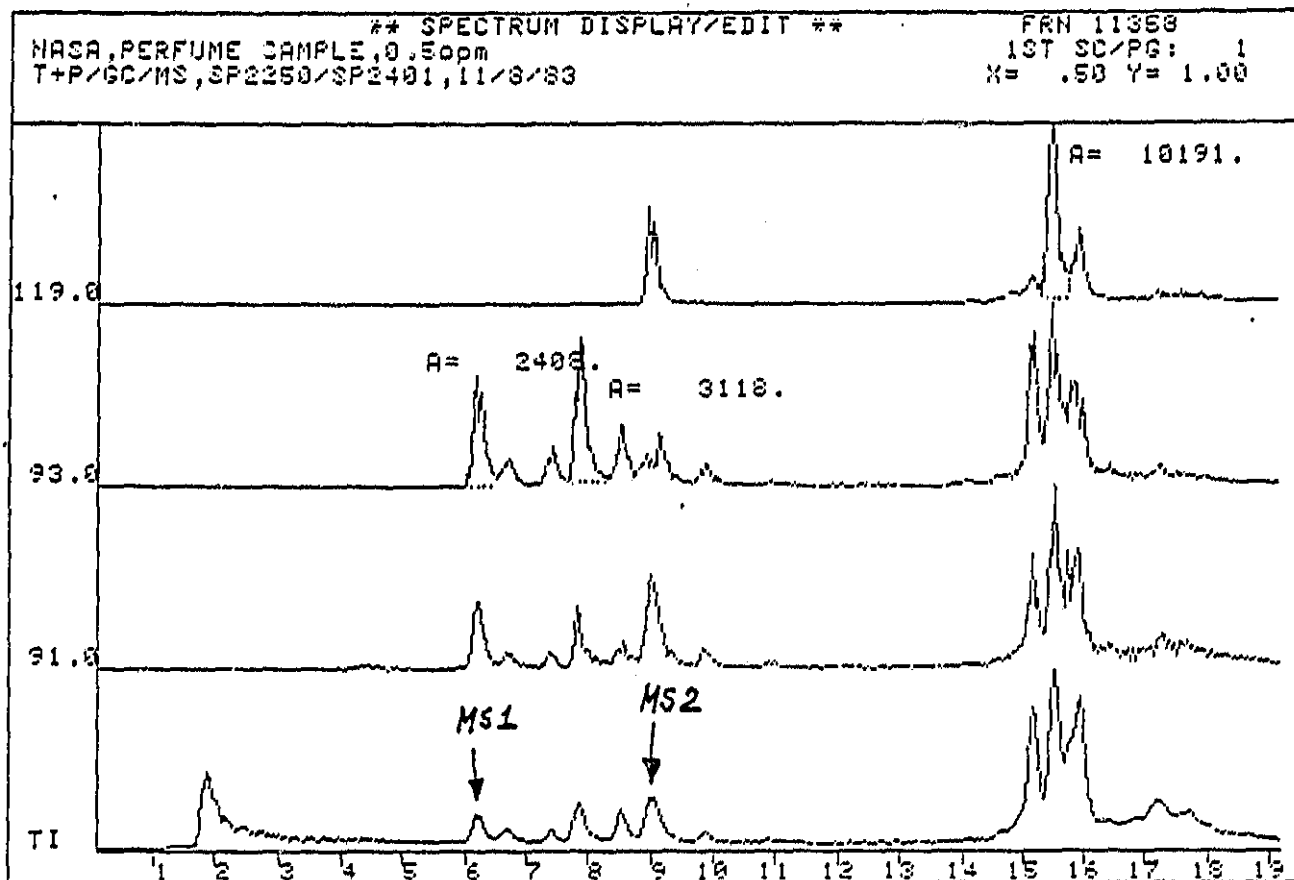
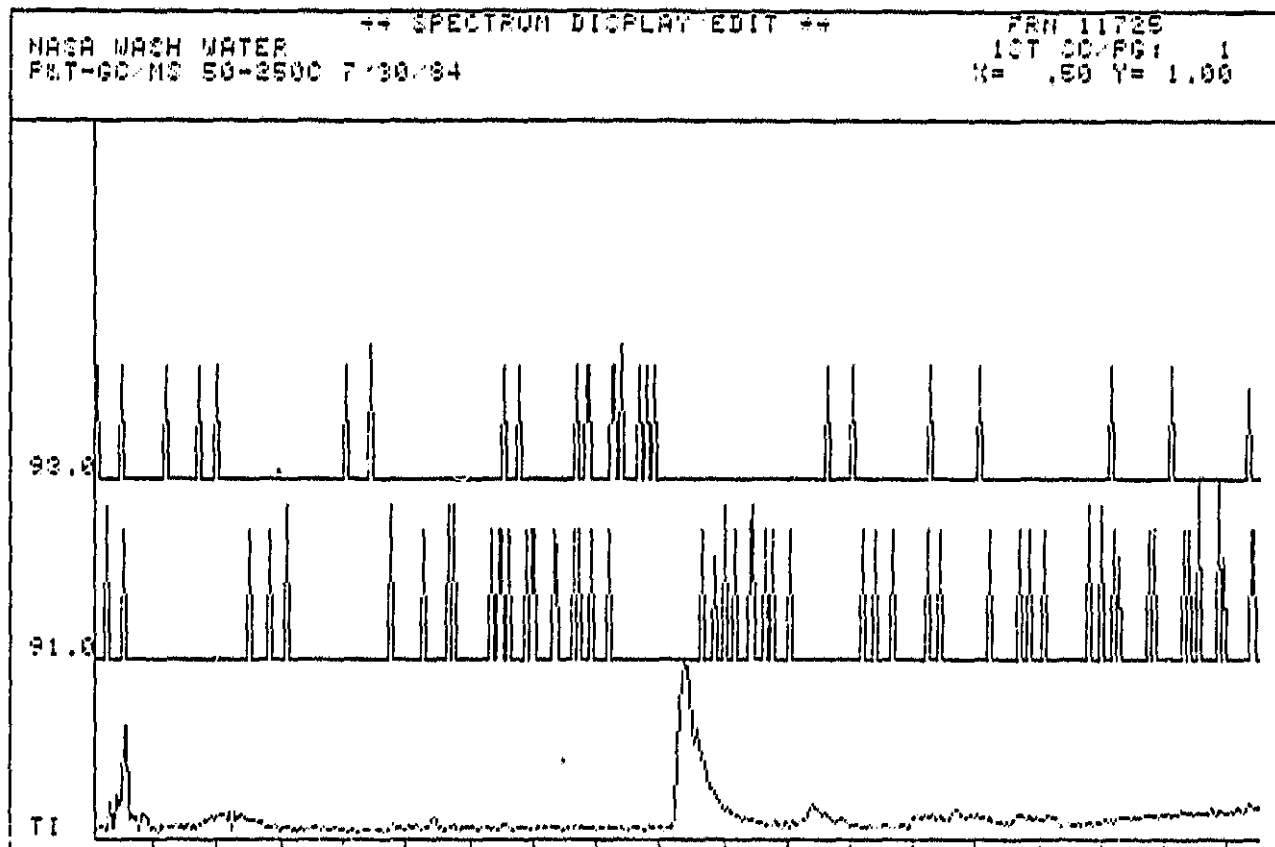
Description

3g	Upper: DIP-MS of blank Lower: Mass spectrum taken at 3.7 min (MS1)
3h	Mass spectrum taken at 12.3 min (MS2) (large fragments at m/z 446, 447, 448 can be attributed to diffusion pump oil)
4	Upper: DIP-MS - total ion (TI) current profile and three extracted iontograms (at m/z, 45, 74, 89) characteristic for lactic acid Lower: Mass spectrum of lactic acid
5	Upper: DIP-MS total ion and extracted iontograms for three fragments characteristic for urea (m/z 43, 44, 60) Lower: Mass spectrum of urea
6a	DIP-MS profile of water residue iontograms extracted at m/z 149 (typical for phthalates)
6b	Mass spectra (MS1, MS2) taken at 4.1 min and 5.9 min
6c	Mass spectra MS1' and MS2' (MS1 and MS2 with subtracted background)
6d	Spectral library search for MS1'
6e	Spectral library search for MS2' (Both searches in Figs. 6d and 6e were unsuccessful for matching phthalates, because larger alkyl fragments from lanolin were masking the correct library hits.)

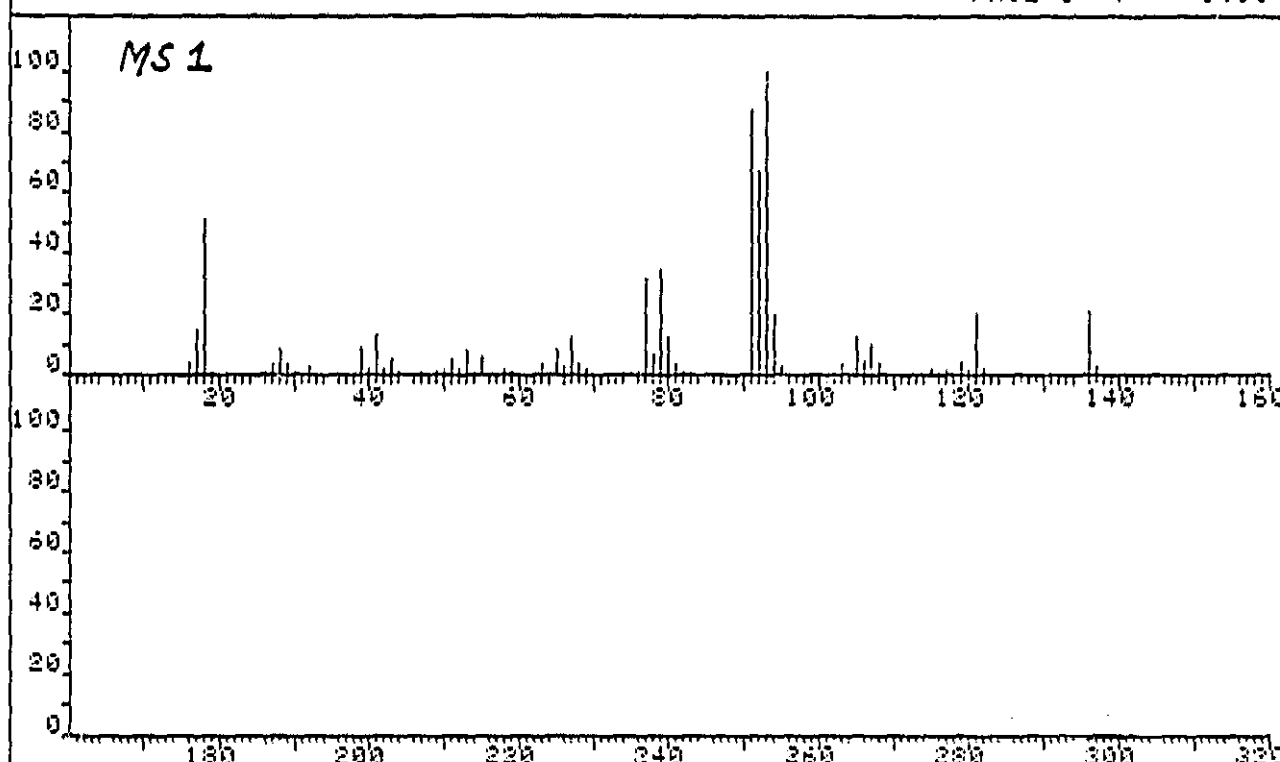
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FRN 11357 SPECTRA 150 RETENTION TIME 6.2
 LARGST 4: 93.2, 100.0 91.1, 82.8 83.1, 57.0 18.1, 51.0
 LAST 4: 121.1, 20.0 122.4, 1.9 136.2, 21.3 137.1, 2.2
 PAGE 1 Y = 1.00



LIBRARIES FOR SEARCH? N
 LOW AND HIGH MOLECULAR WEIGHT LIMIT? C 1.0_ 9999.01 90,160
 USE DEFAULT SEARCH OPTIONS? Y
 WORKING...

REF. SPECT == 150 LSN= 150. MW= 0 FRN=11357 RET. TIME= 6.2
 68 PEAKS, 49 SIGNIFICANT MAX K 19.2

LIBRARY 3000 7063 SPECTRA SEARCHED, 10 HIT(S)

.9775 Tricyclo[2.2.1.0^{1,4}]heptan-2-one, 6-nitro- (9CI)
 SPEC= 770 LSN= 6529. MW= 153 C7H7NO3
 FRN = 3005 INB3 6529.1 CAS # 0058666503 EPA # 0000036807
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 328
 15.4 10 17% .0 0 0% .0 0 0% MULTIPLIER= .45

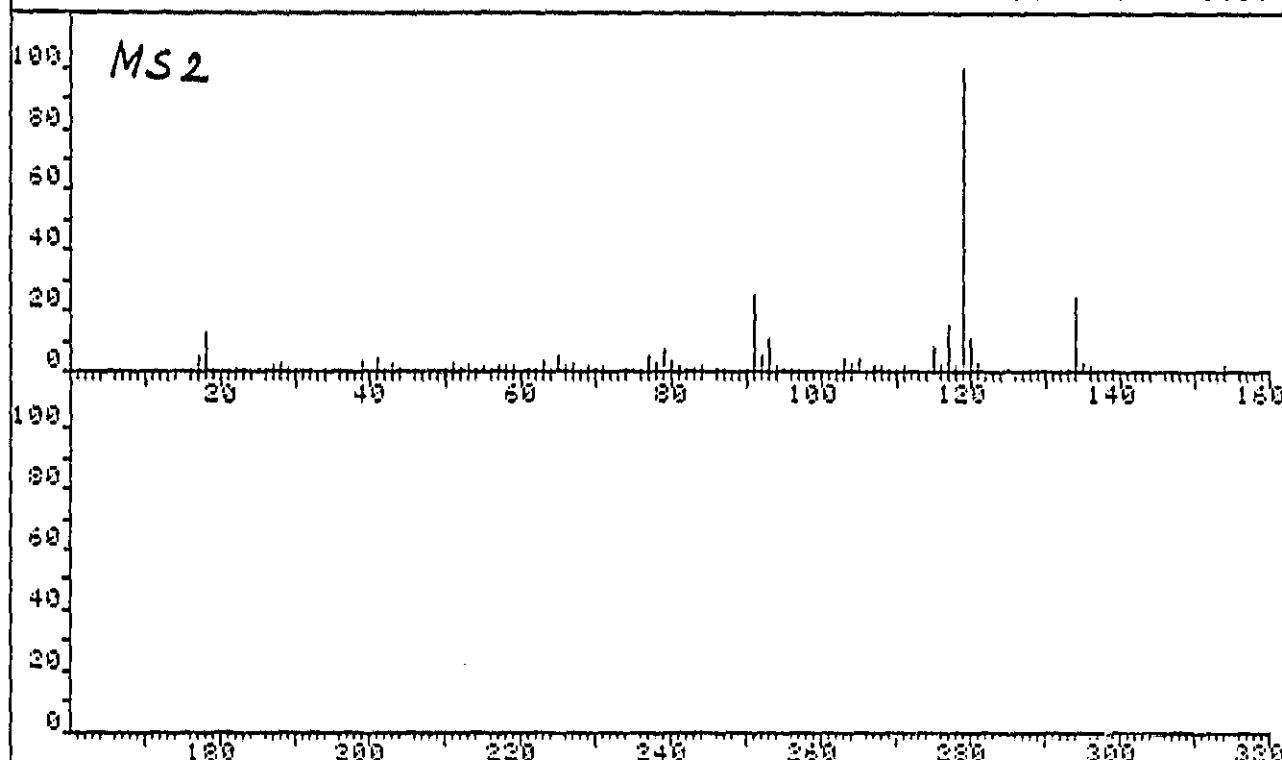
.9757 Benzenecetic acid, .alpha.-hydroxy- (9CI)
 SPEC= 662 LSN= 6421. MW= 152 C8H8O3
 FRN = 3005 INB3 6421.1 CAS # 0000090642 EPA # 0000004882
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
 13.4 8 17% .0 0 0% .0 0 0% MULTIPLIER= .35

.9755 + Cyclobutene, 2-propenylidene- (9CI)
 SPEC= 757 LSN= 757. MW= 92 C7H8
 FRN = 3002 INB3 757.1 CAS # 0052097855 EPA # 0000029595
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 568
 13.8 9 29% .0 0 0% .0 0 0% MULTIPLIER= .81

.9742 + Benzene, methyl- (9CI)
 SPEC= 750 LSN= 750. MW= 92 C7H8
 FRN = 3002 INB3 750.1 CAS # 0000108883 EPA # 0000019587
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
 12.7 8 28% .0 0 0% .0 0 0% MULTIPLIER= .68

.9703 3-Cyclobutene-1,2-dione, 3,4-dihydroxy- (9CI)

FRN 11357 SPECTRUM 219 RETENTION TIME 9.0
LARGCT 4: 119.2, 100.0 91.1, 35.0 134.1, 23.9 117.2, 15.7
LAST 4: 136.2, 1.5 137.1, .2 139.2, .9 154.2, 1.6
PAGE 1 Y = 1.00



LIBRARIES FOR SEARCH? N
LSM AND HIGH MOLECULAR WEIGHT LIMIT? 1.0_ 5555.0: 119,100
USE DEFAULT SEARCH OPTIONS? Y
WORKING...

REF. SPECT # = 219 LSN = 219. MW = 0 FRN = 11357 RET. TIME = 9.0
94 PEAKS, 50 SIGNIFICANT MAX K 19.8

LIBRARY 3000 8018 SPECTRA SEARCHED, 10 HIT(S)

.9810 + Benzene, 1-methyl-3-(1-methylethyl)- (9CI)
SPEC = 3923 LSN = 3923. MW = 134 C10H14
FRN = 3002 (NBS 3923.1 CAS # 0000535773 EPA # 0000003134
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 738
19.6 10 61% .0 0 0% .0 0 0% MULTIPLIER = 1.00

.9809 + Benzene, 1-methyl-2-(1-methylethyl)- (9CI)
SPEC = 3922 LSN = 3922. MW = 134 C10H14
FRN = 3002 (NBS 3922.1 CAS # 0000527844 EPA # 0000003133
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 738
19.4 10 60% .0 0 0% .0 0 0% MULTIPLIER = 1.00

.9807 + Benzene, 1-methyl-4-(1-methylethyl)- (9CI)
SPEC = 3914 LSN = 3914. MW = 134 C10H14
FRN = 3002 (NBS 3914.1 CAS # 0000099276 EPA # 0000003135
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 738
19.2 10 60% .0 0 0% .0 0 0% MULTIPLIER = 1.00

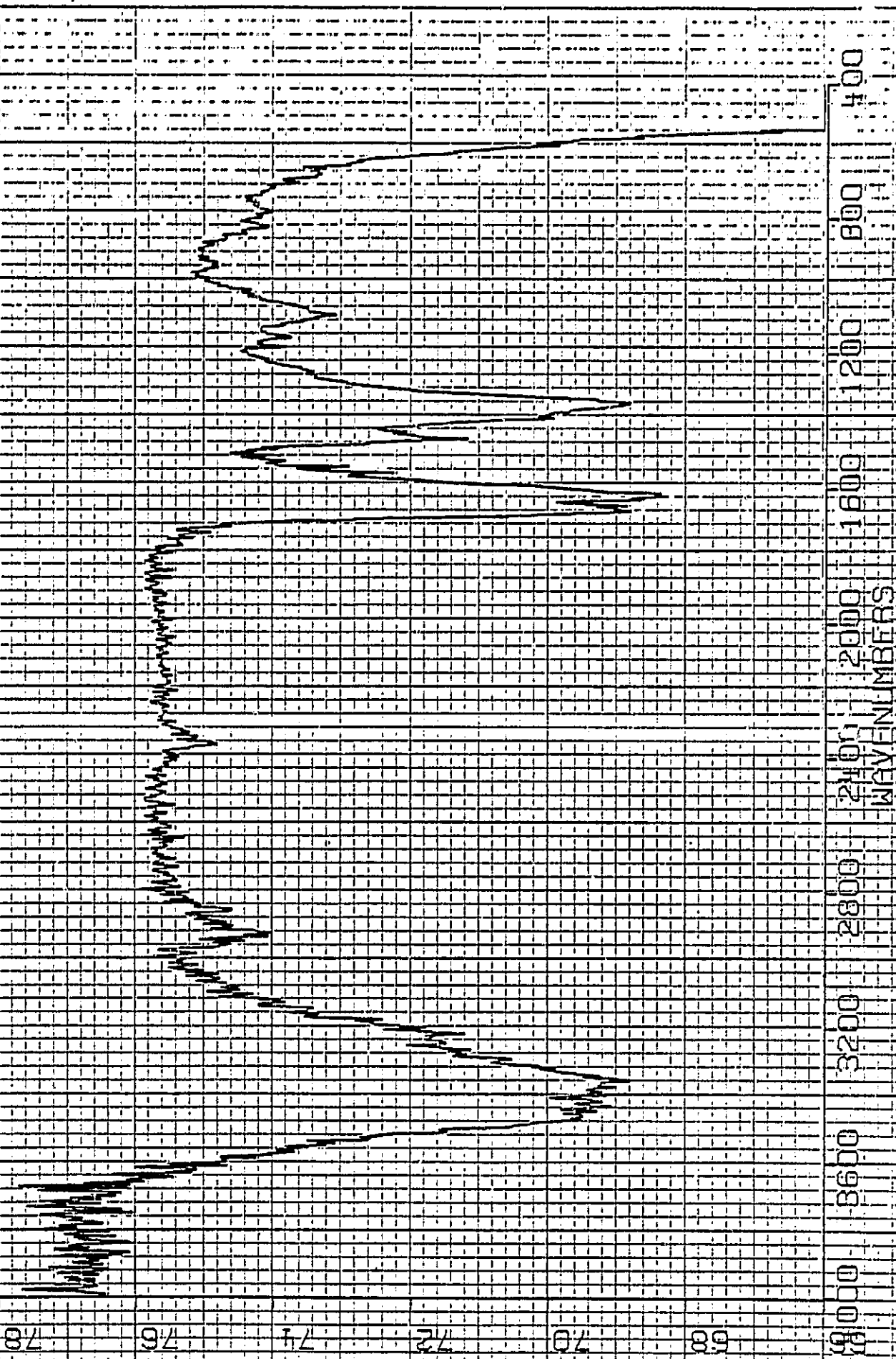
.9784 Benzene, (1,1-dimethylbutyl)- (8CI)
SPEC = 2142 LSN = 7901. MW = 162 C12H18
FRN = 3005 (NBS 7901.1 CAS # 0001985575 EPA # 00000034512
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 738
16.6 9 49% .0 0 0% .0 0 0% MULTIPLIER = .67

.9780 + Ethanone, 1-(methylphenyl)- (9CI)

SPRINGBORN LABORATORIES, INC.

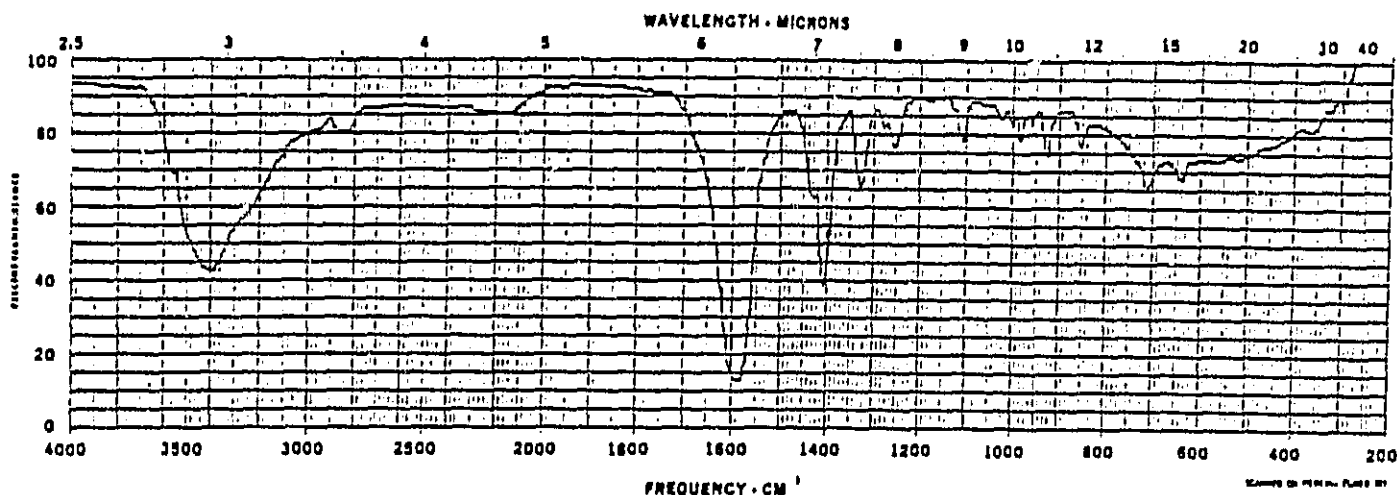
NASA 6037-13-2

PURIFIED WASH WATER - RESIDUE 105C
9/24/84 ON KOL FROM ACETONITRILE



SEQUESTRENE Na_2Ca RECRYST.
DISODIUM CALCIUM ETHYLENEDIAMINETETRAACETIC ACID
KBr Wafer

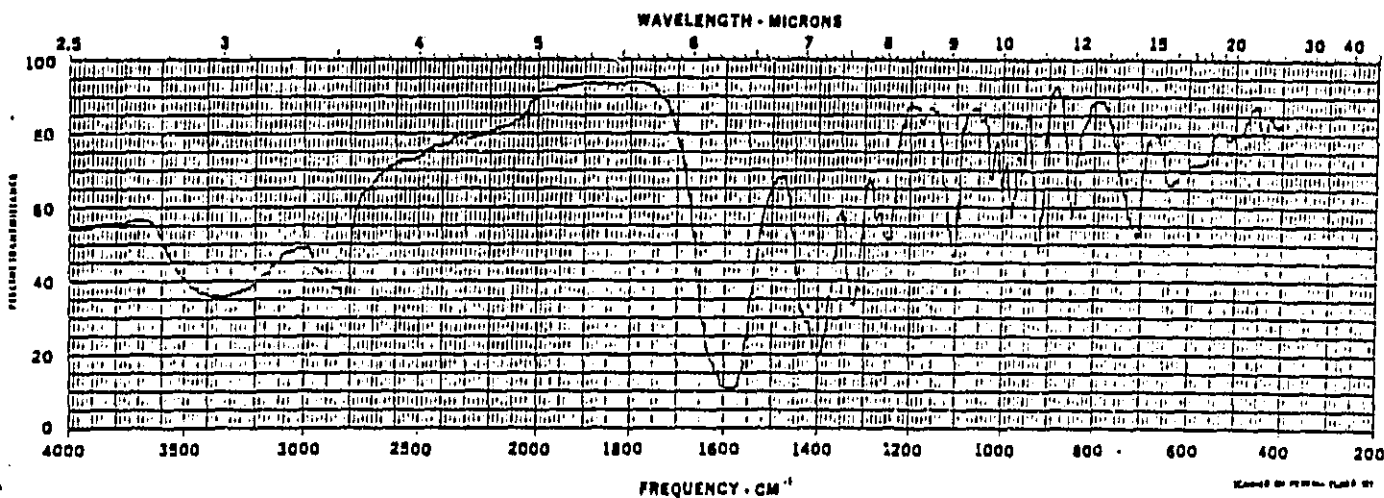
Source: CIBA-GEIGY Corporation, Dyestuffs and Chemicals Division



SEQUESTRENE Na_2Ca
DISODIUM CALCIUM ETHYLENEDIAMINETETRAACETIC ACID
Film (Cast from AgCl)

1892

Source: CIBA-GEIGY Corporation, Dyestuffs and Chemicals Division

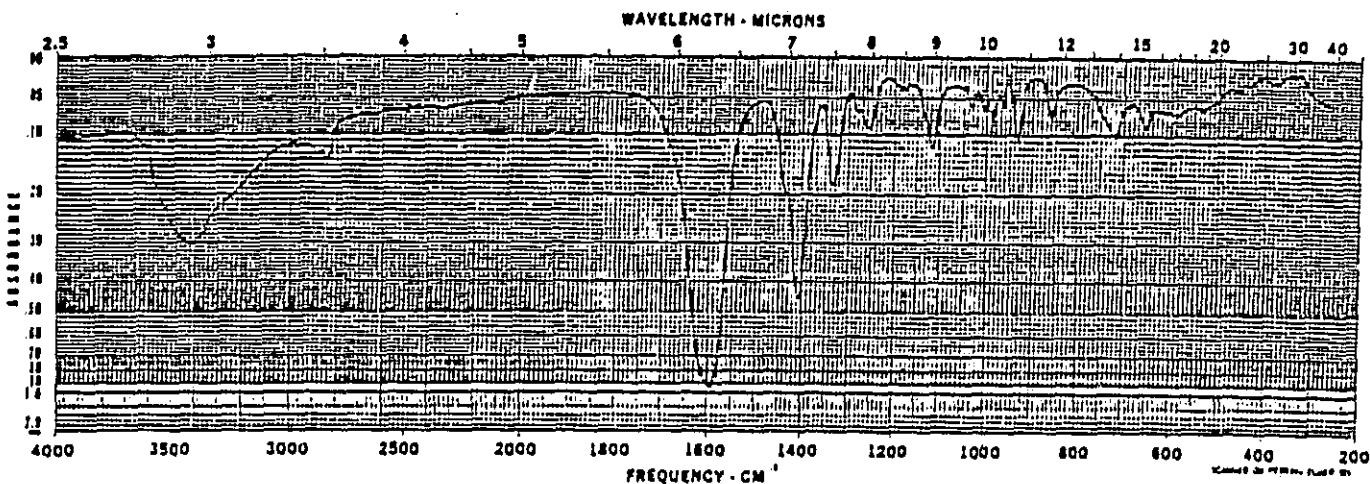


VERSENE CA CHELATING AGENT
CALCIUM DISODIUM ETHYLENEDIAMINETETRAACETATE, DIHYDRATE
KBr Wafer

Source: The Dow Chemical Company

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1893



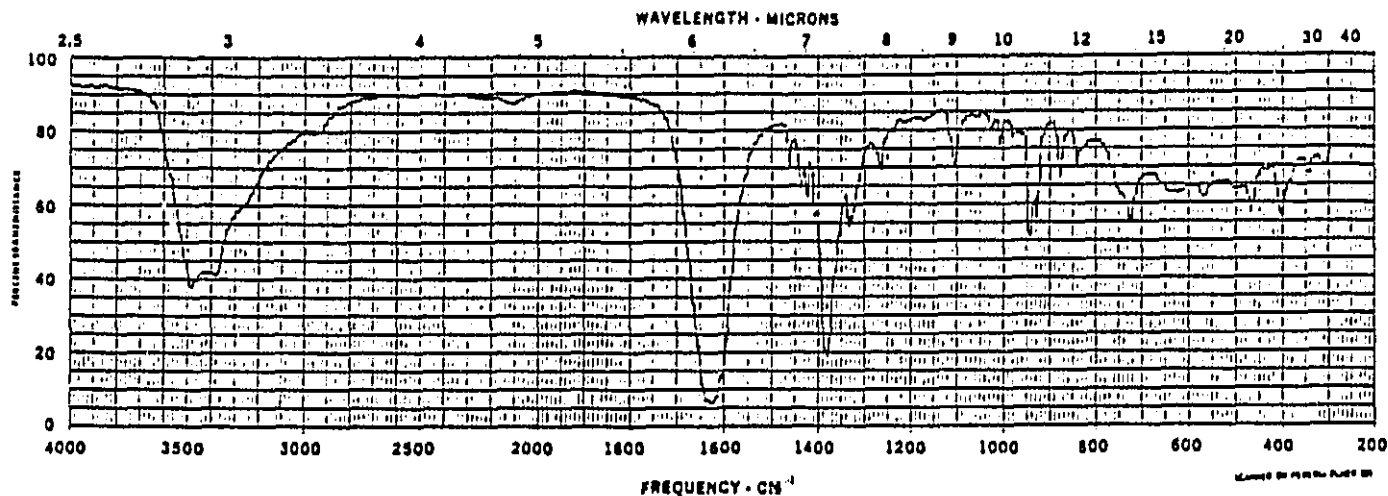
SEQUESTRENE NaFe

1894

SODIUM FERRIC ETHYLENEDIAMINETETRAACETIC ACID

KBr Wafer

Source: CIBA-GEIGY Corporation, Dyestuffs and Chemicals Division



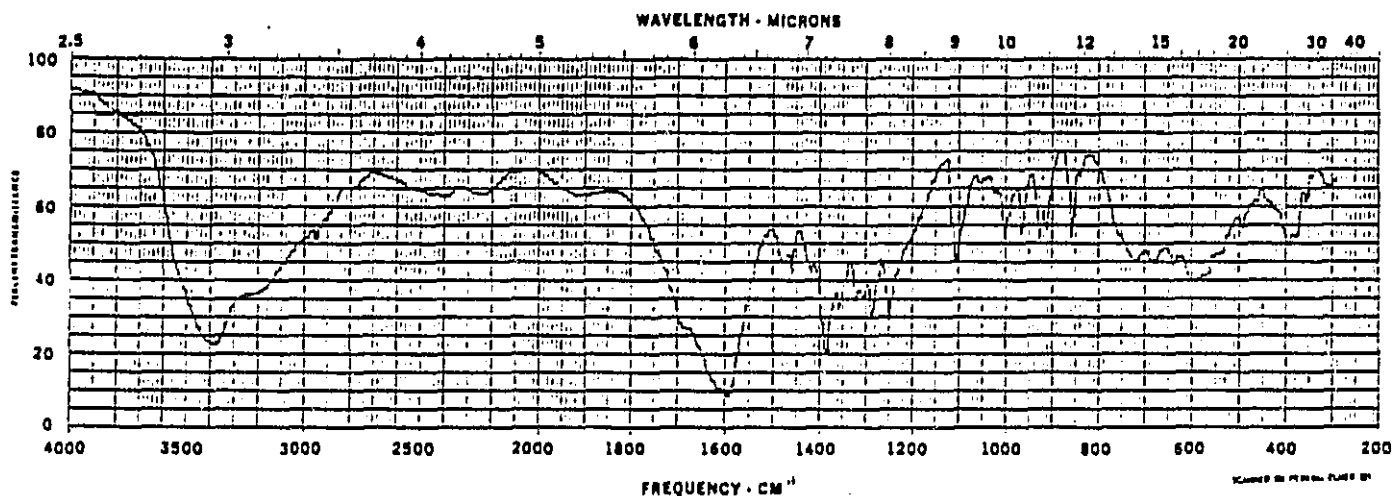
SEQUESTRENE H₂Fe

1895

ETHYLENEDIAMINETETRAACETIC ACID, FERROUS SALT

KBr Wafer

Source: CIBA-GEIGY Corporation, Dyestuffs and Chemicals Division



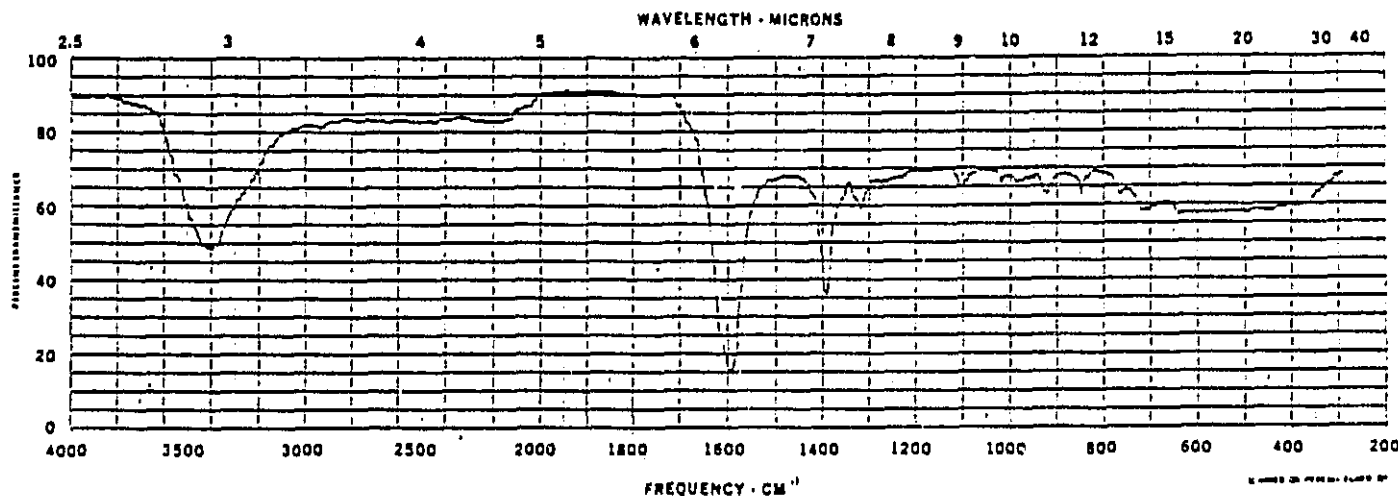
SEQUESTRENE Na₂Co

1896

DISODIUM COBALTOUS ETHYLENEDIAMINETETRAACETIC ACID

KBr Wafer

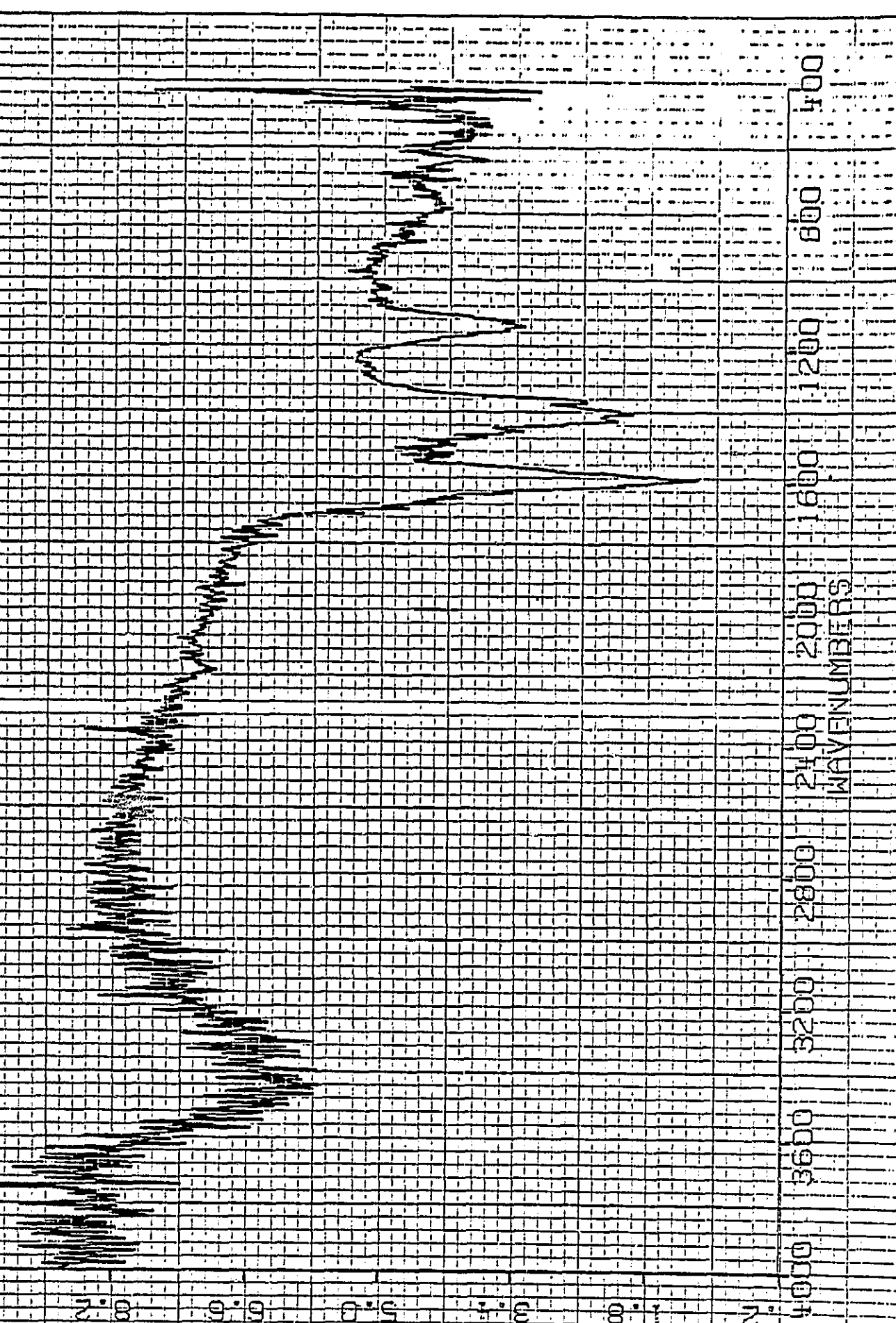
Source: CIBA-GEIGY Corporation, Dyestuffs and Chemicals Division



SPRINGBORN LABORATORIES, INC.

NAS-6037-13-2

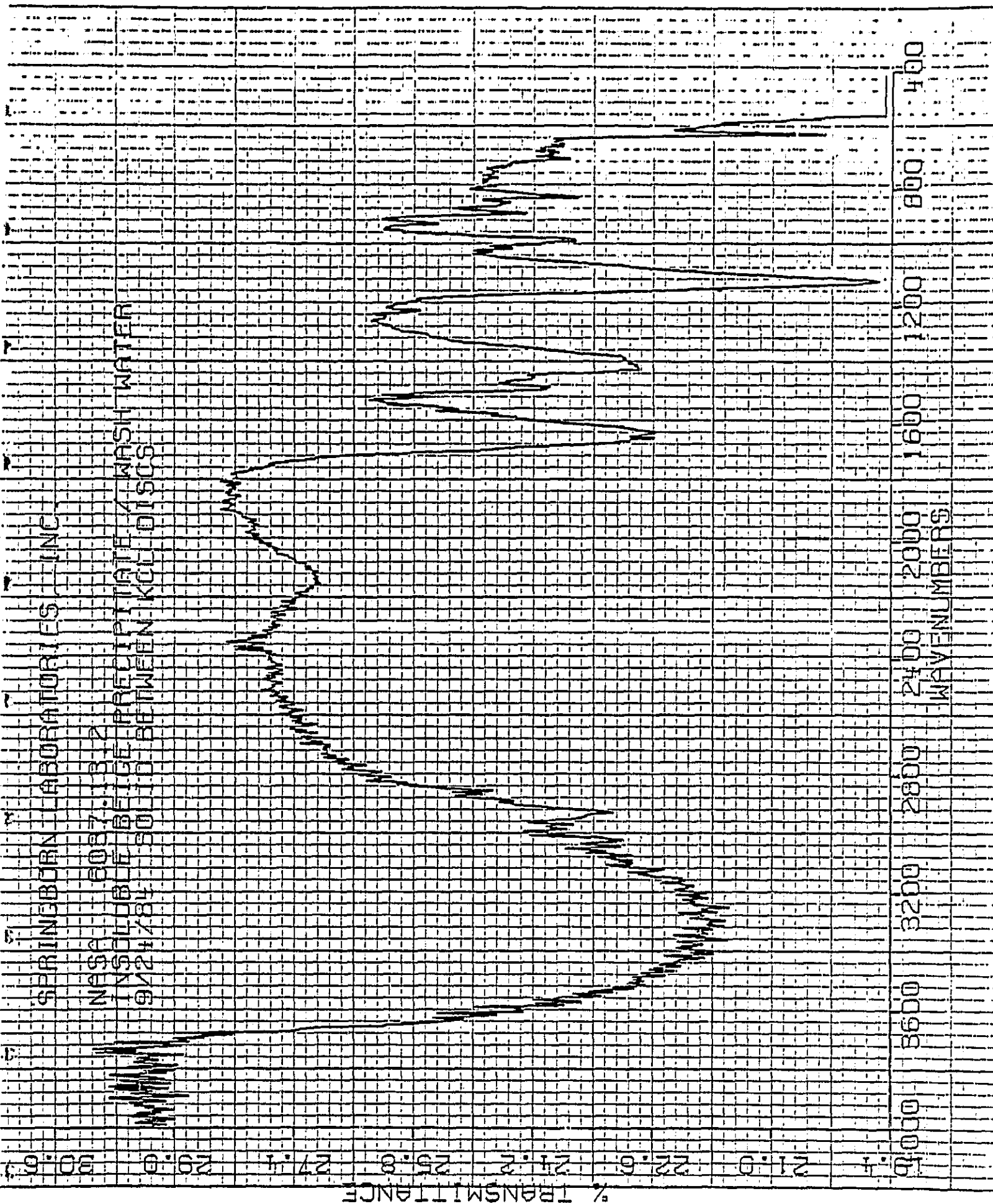
PURIFIED WASH WATER - RESIDUE 1050
9124784 ON KRS-5, WATER SOLUBLE

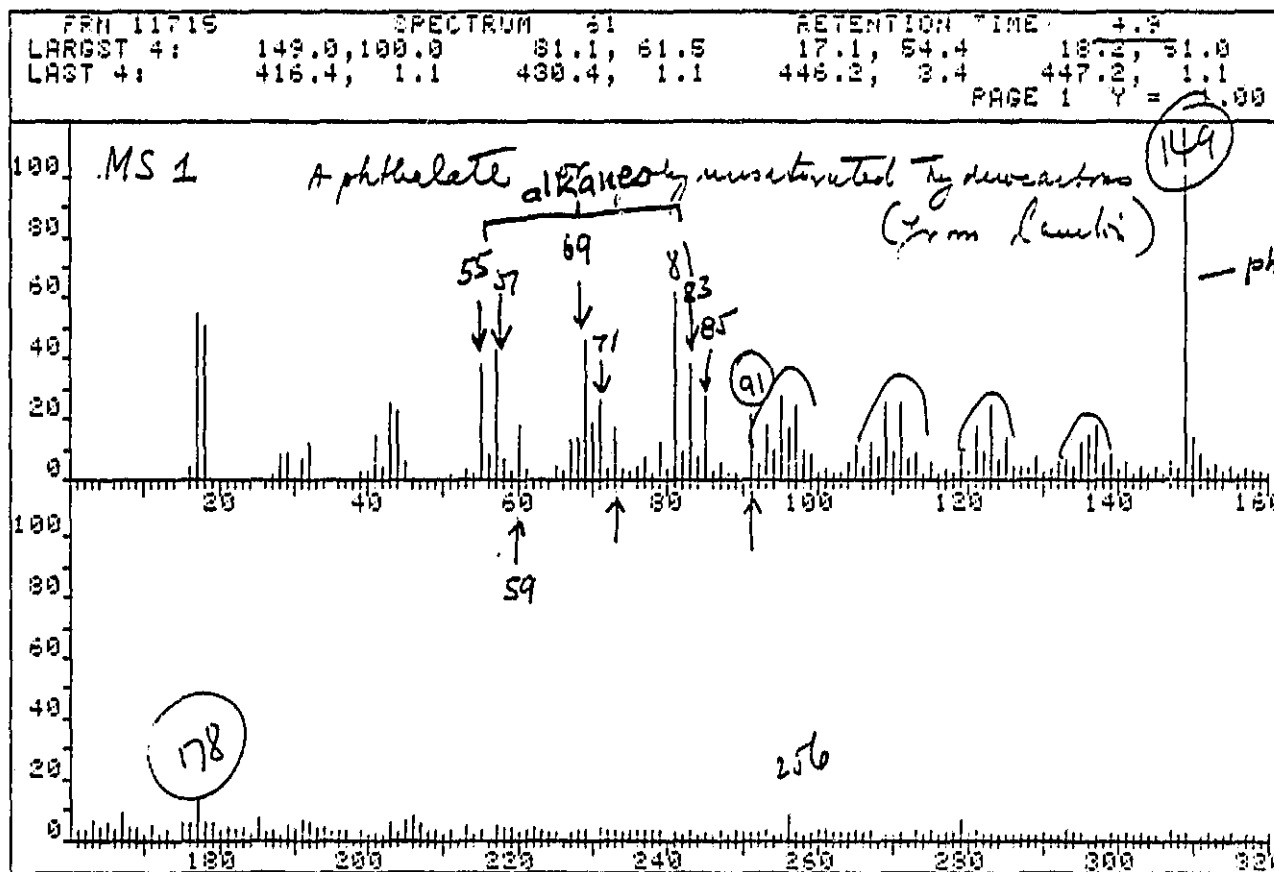
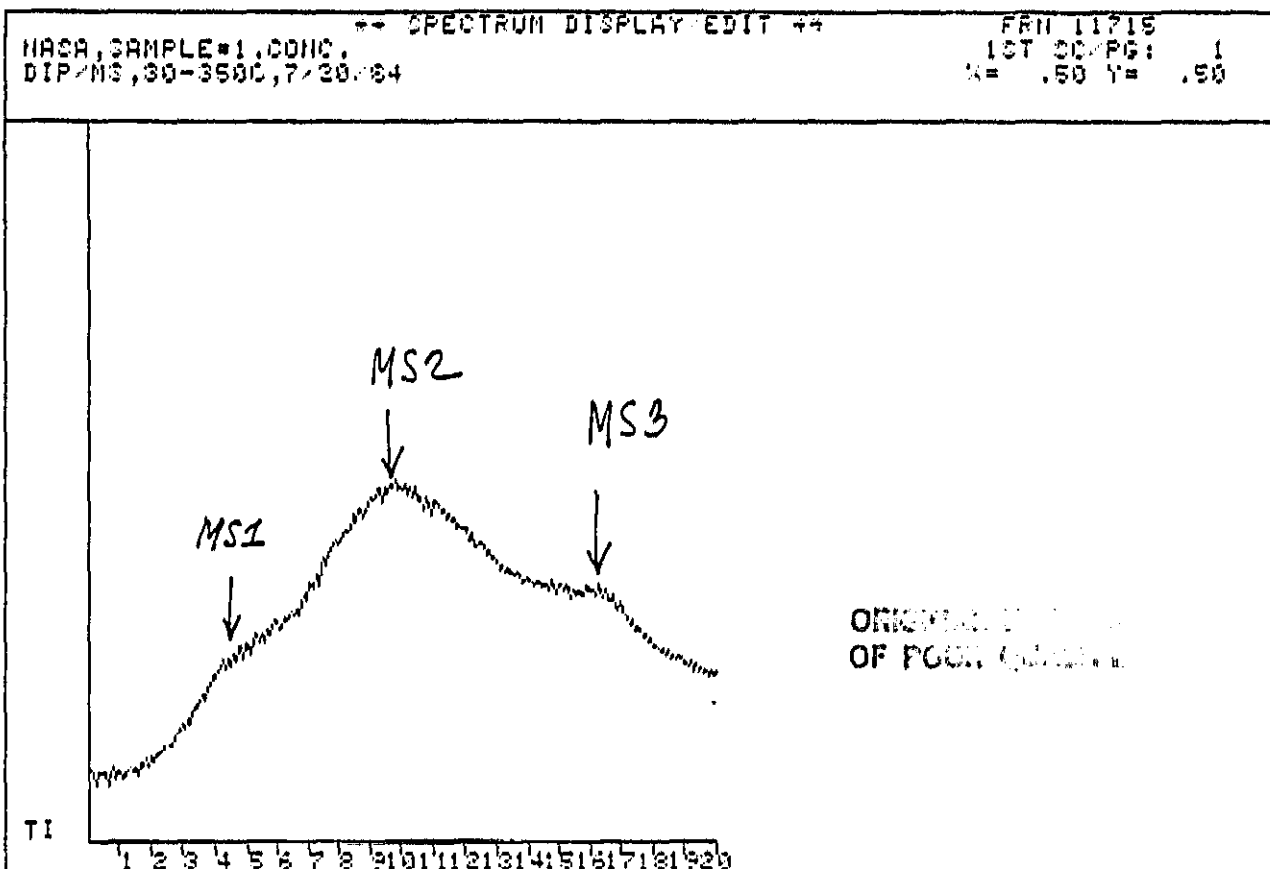


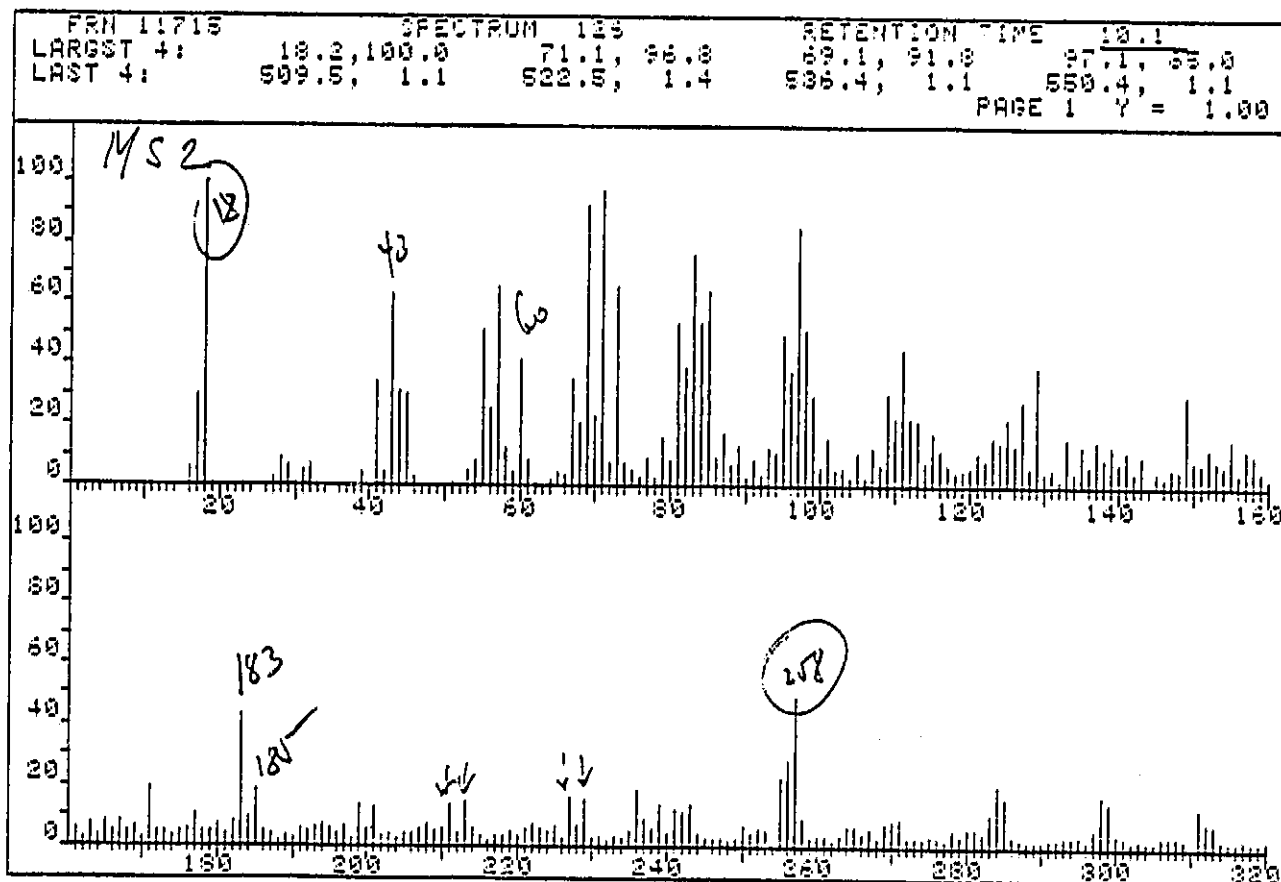
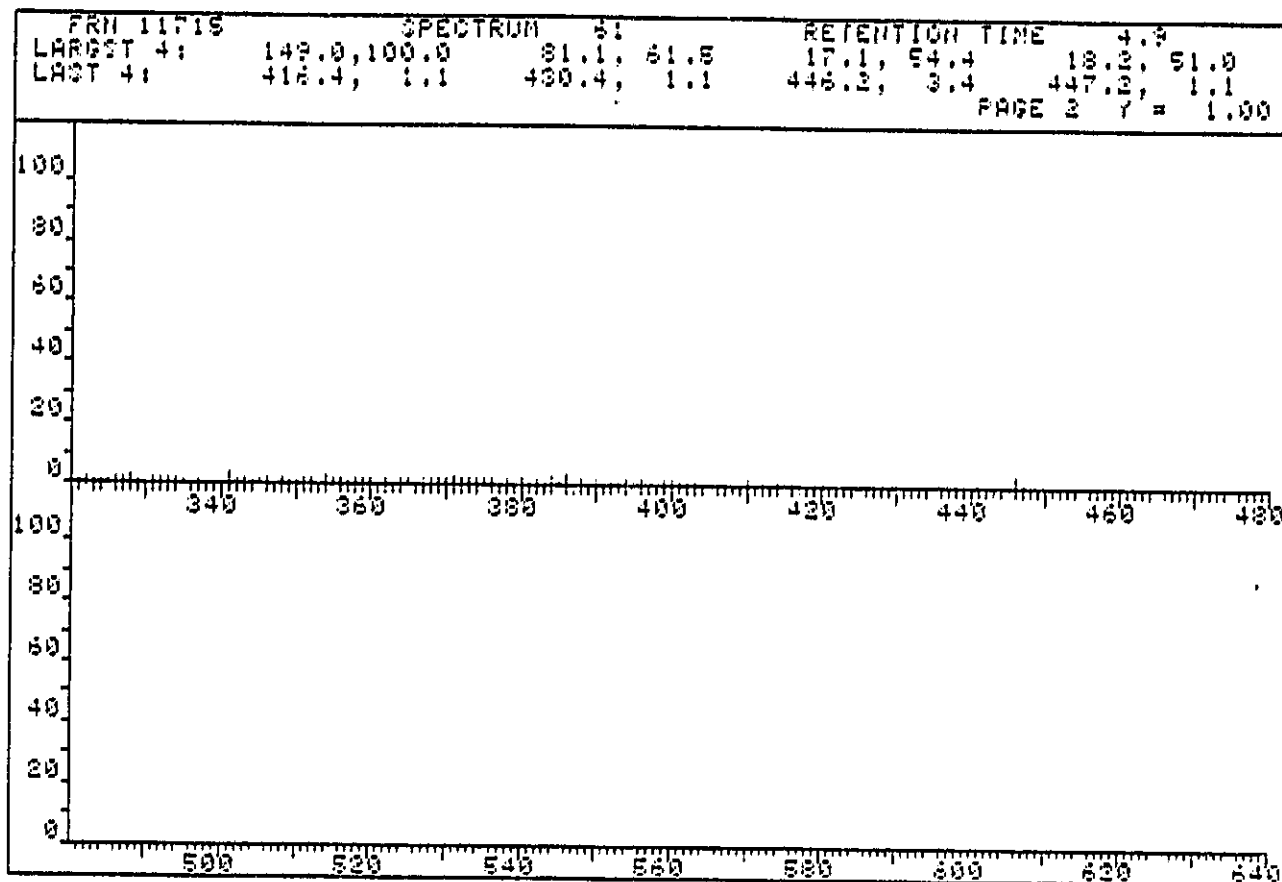
SPRINGBURN LABORATORIES, INC.

NASA 6037-13-2

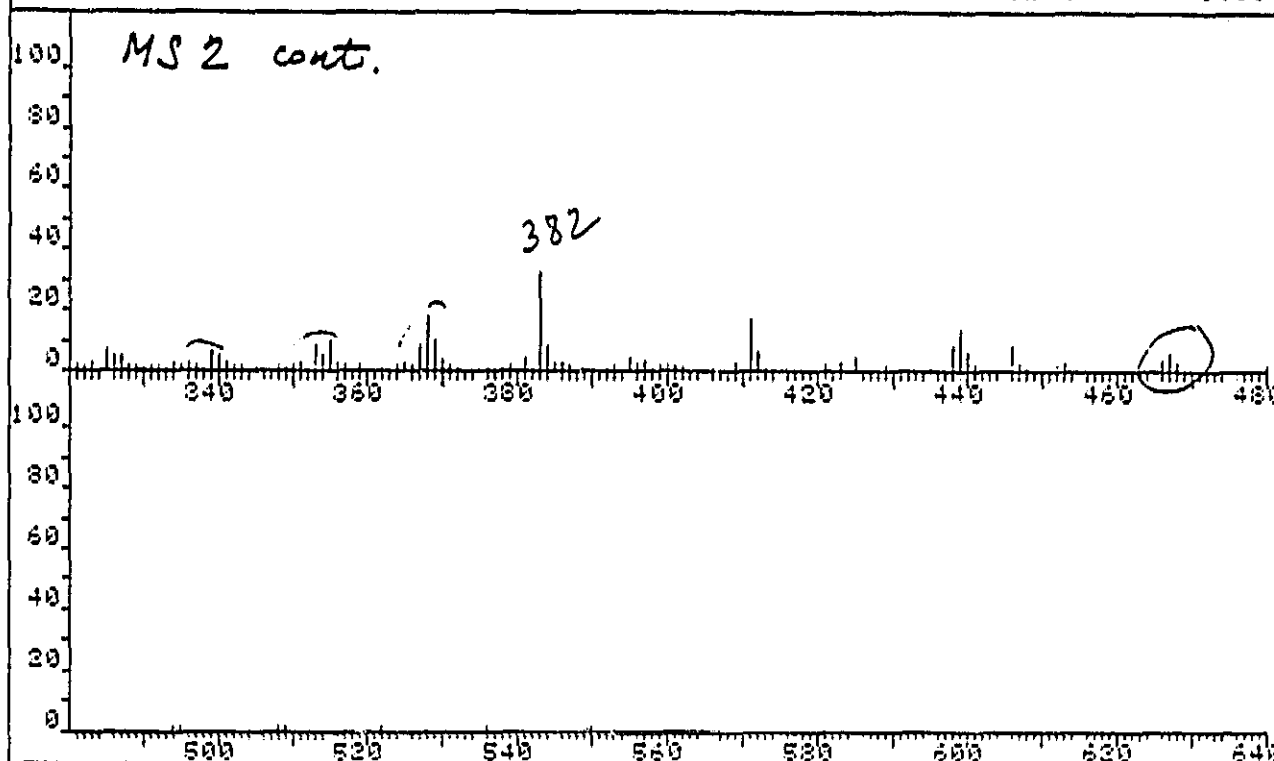
VSOLUBLE BEIGE PRECIPITATE / WASH WATER
9/24/84 SOLID BETWEEN KOLLIDISCS







FRN 11715 SPECTRUM 136 RETENTION TIME 10.1
LARGEST 4: 18.2, 100.0 71.1, 96.8 229.1, 91.8 37.1, 85.0
LAST 4: 509.5, 1.1 522.5, 1.4 536.4, 1.1 550.4, 1.1
PAGE 2 Y = 1.00



REF. SPECT # = 126 LSN = 126. MW = 0 FRN = 11715 RET. TIME = 10.1
378 PEAKS, 376 SIGNIFICANT MAX K 23.6

LIBRARY 3000 3401 SPECTRA SEARCHED, 10 HIT(S)

.9789 5.alpha.-Cholestan-6-one, 3.alpha.-chloro- (9CI)
SPEC = 94 LSN = 28222. MW = 420 C27H45ClO
FRN = 3020 INBS 28225.1 CAS # 0021072865 EPA # 0000048891
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 674
18.4 10 5% .0 0 0% .0 0 0% MULTIPLIER = 1.16

.9787 + 5.alpha.-Cholesta-7,9(11)-dien-3.beta.-ol, 14-methyl-, acetate (9CI)
SPEC = 666 LSN = 28794. MW = 440 C30H48O2
FRN = 3020 INBS 28797.1 CAS # 0005596021 EPA # 0000048999
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 670
17.9 10 3% .0 0 0% .0 0 0% MULTIPLIER = .79

.9786 Ergostane-3,5,6,12,25-pentol, 25-acetate, (3.beta.,5.alpha.,5.beta.,12.beta.)- (9CI)
SPEC = 1942 LSN = 30070. MW = 508 C30H52O6
FRN = 3020 INBS 30073.1 CAS # 0056053000 EPA # 0000049211
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 611
17.2 10 2% .0 0 0% .0 0 0% MULTIPLIER = .39

.9781 Phosphonic acid, (1,4-diaminobutyl)-, pentakis(trimethylsilyl) deriv. (9CI)
SPEC = 2157 LSN = 30285. MW = 520 C19H53N2O3PSi5
FRN = 3020 INBS 30288.1 CAS # 0056211268 EPA # 0000024500
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 598
16.5 9 3% .0 0 0% .0 0 0% MULTIPLIER = .54

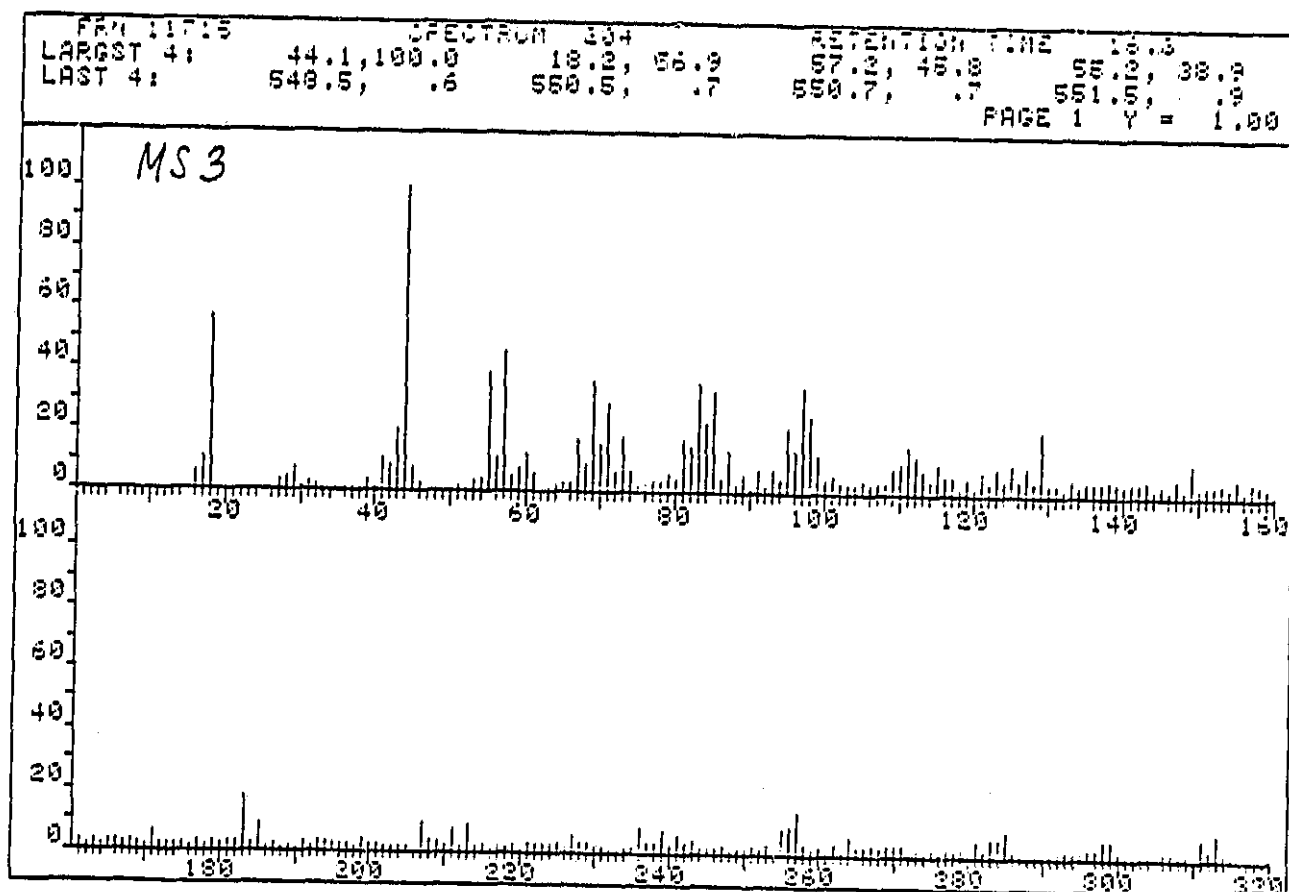
.9776 → Hexacosane, 9-octyl- (9CI)
SPEC= 1550 LSN= 29578. MW= 478 C34H70
FRN = 3020 (NBS 29581.1 CAS # 0055429839 EPA # 0000017993
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 511
16.5 10 3% .0 0 0% .0 0 0% MULTIPLIER= 1.38

.9774 + Cholesta-9(11),20(22)-diene-3,23-dione, 6-hydroxy-, (5.alpha.
.,6.alpha.)- (9CI)
SPEC= 3332 LSN= 27902. MW= 412 C27H40O3
FRN = 3017 (NBS 27905.1 CAS # 0050676998 EPA # 0000046825
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 646
17.0 9 4% .0 0 0% .0 0 0% MULTIPLIER= .39

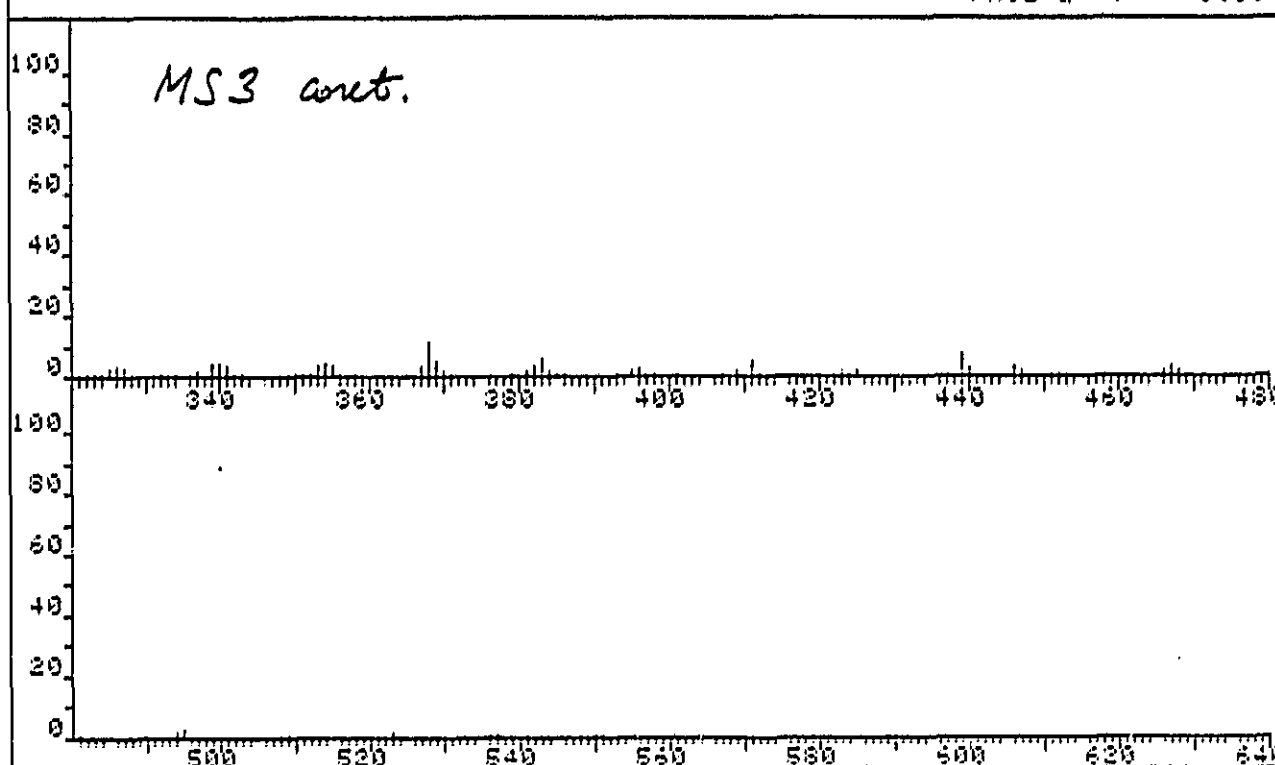
.9773 14,16-Hentriacontanedione (9CI9CI)
SPEC= 1259 LSN= 29397. MW= 464 C31H60O2
FRN = 3020 (NBS 29400.1 CAS # 0024724843 EPA # 0000029540
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 511
16.3 9 3% .0 0 0% .0 0 0% MULTIPLIER= .54

.9771 Cyclopentane, 1-(2-decyldodecyl)-2,4-dimethyl- (9CI)
SPEC= 3174 LSN= 27744. MW= 406 C29H58
FRN = 3017 (NBS 27747.1 CAS # 0055429260 EPA # 0000017092
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 584
16.8 10 9% .0 0 0% .0 0 0% MULTIPLIER= .73

.9771 → 1-Dotriacontanol (9CI9CI)
SPEC= 1314 LSN= 29442. MW= 466 C32H66O
FRN = 3020 (NBS 29445.1 CAS # 0006624799 EPA # 0000017862
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 525
16.3 10 10% .0 0 0% .0 0 0% MULTIPLIER= 1.23



FRN 11715 SPECTRUM 204 RETENTION TIME 16.3
LARGEST 4: 44.1, 100.0 18.2, 56.2 57.3, 45.8 55.2, 38.2
LAST 4: 548.5, .5 550.5, .7 550.7, .7 551.8, .9
PAGE 2 7 = 1.00



REF. SPECT # = 204 LSN = 204. MW = 0 FRN=11715 RET. TIME = 16.3
364 PEAKS, 278 SIGNIFICANT MAX K 24.0

LIBRARY 3000 3401 SPECTRA SEARCHED, 10 HIT(S)

.9768 Cyclopropa[5,6]stigmast-22-en-3-one, 3',6-dihydro-, (5.beta.,
6.alpha.,22E)- (9CI)
SPEC = 217 LSN = 28345. MW = 424 C30H48O
FRN = 3020 [NBS 28343.] CAS # 0053755401 EPA # 0000048906
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 663
18.0 9 4% .0 0 0% .0 0 0% MULTIPLIER = .32

.9778 → Hexadecane, 1,1-bis(dodecyloxy)- (9CI)
SPEC = 2690 LSN = 30818. MW = 594 C40H82O2
FRN = 3020 [NBS 30821.] CAS # 0055554644 EPA # 0000036104
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 728
16.1 10 16% .0 0 0% .0 0 0% MULTIPLIER = .39

.9763 → 1-Dotriacontanol (9CI9CI)
SPEC = 1314 LSN = 29442. MW = 466 C32H66O
FRN = 3020 [NBS 29445.] CAS # 0006624799 EPA # 0000017862
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 525
16.3 10 17% .0 0 0% .0 0 0% MULTIPLIER = .54

.9766 → 1-Hentetracontanol (9CI)
SPEC = 2676 LSN = 30804. MW = 592 C41H84O
FRN = 3020 [NBS 30807.] CAS # 0040710427 EPA # 0000037863
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX = 673
14.9 9 15% .0 0 0% .0 0 0% MULTIPLIER = .54

SPEC= 1551 LSN= 29579. MW= 478 C34H70
 FRN = 3020 [NBS 29582.1 CAS # 0055429840 EPA # 0000017521
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 614
 15.8 10 9% .0 0 0% .0 0 0% MULTIPLIER= .54

.9759 Cycloprop[7,8]ergost-22-en-3-one, 3',7'-dihydro-, (5.alpha.,7
 .beta.,8.alpha.,22E)- (9CI)
 SPEC= 3280 LSN= 27850. MW= 410 C29H48O
 FRN = 3017 [NBS 27853.1 CAS # 0053755183 EPA # 0000048805
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 537
 15.8 8 4% .0 0 0% .0 0 0% MULTIPLIER= .35

.9755 → 17-Pentatriacontene (9CI)
 SPEC= 1745 LSN= 29873. MW= 490 C35H70
 FRN = 3020 [NBS 29876.1 CAS # 0006971400 EPA # 0000018085
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 597
 14.6 9 17% .0 0 0% .0 0 0% MULTIPLIER= .38

.9755 Palmitic acid, 2-(tetradecyloxy)ethyl ester (9CI)
 SPEC= 1795 LSN= 29923. MW= 496 C32H64O3
 FRN = 3020 [NBS 29926.1 CAS # 0028843336 EPA # 0000036186
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
 14.6 8 4% .0 0 0% .0 0 0% MULTIPLIER= .46

.9754 6H-Dibenzo[b,d]pyran-9-methanol, 1-(acetyloxy)-6a,7,10,10a-t
 etrahydro-6,6-dimethyl-3-pentyl-, acetate, (6aR-trans)- (9CI)
)
 SPEC= 3410 LSN= 27980. MW= 414 C25H34O5
 FRN = 3017 [NBS 27983.1 CAS # 0041969524 EPA # 0000031536
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 135
 15.4 8 4% .0 0 0% .0 0 0% MULTIPLIER= .35

.9747 Nonacosanol (9CI9CI)
 SPEC= 206 LSN= 28334. MW= 424 C29H60O
 FRN = 3020 [NBS 28337.1 CAS # 0025154567 EPA # 0000017371
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
 14.6 9 15% .0 0 0% .0 0 0% MULTIPLIER= .38

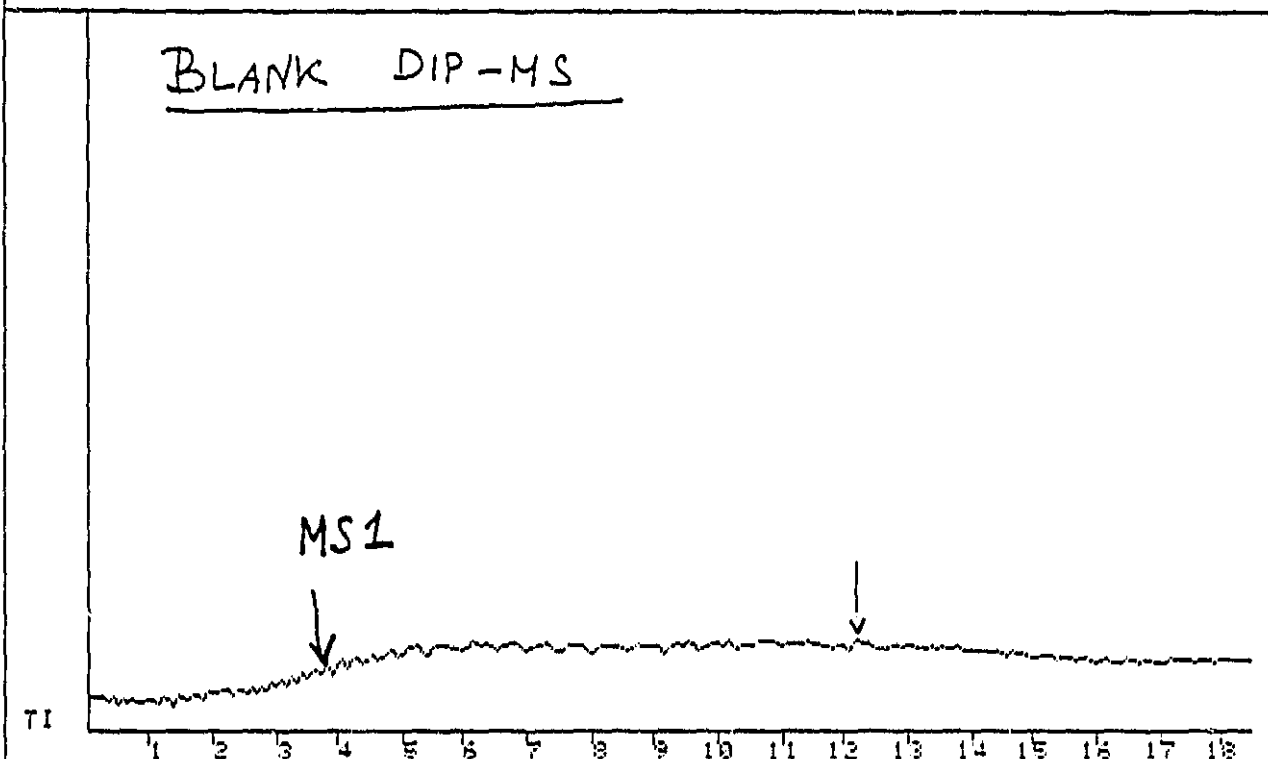
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** SPECTRUM DISPLAY/EDIT **
NACA, METHANOL BLANK
DIP/MS, 30-3000, 7/20/84
FRN 11713
1ST SC/PG: 1
N= 1.00 Y= .13

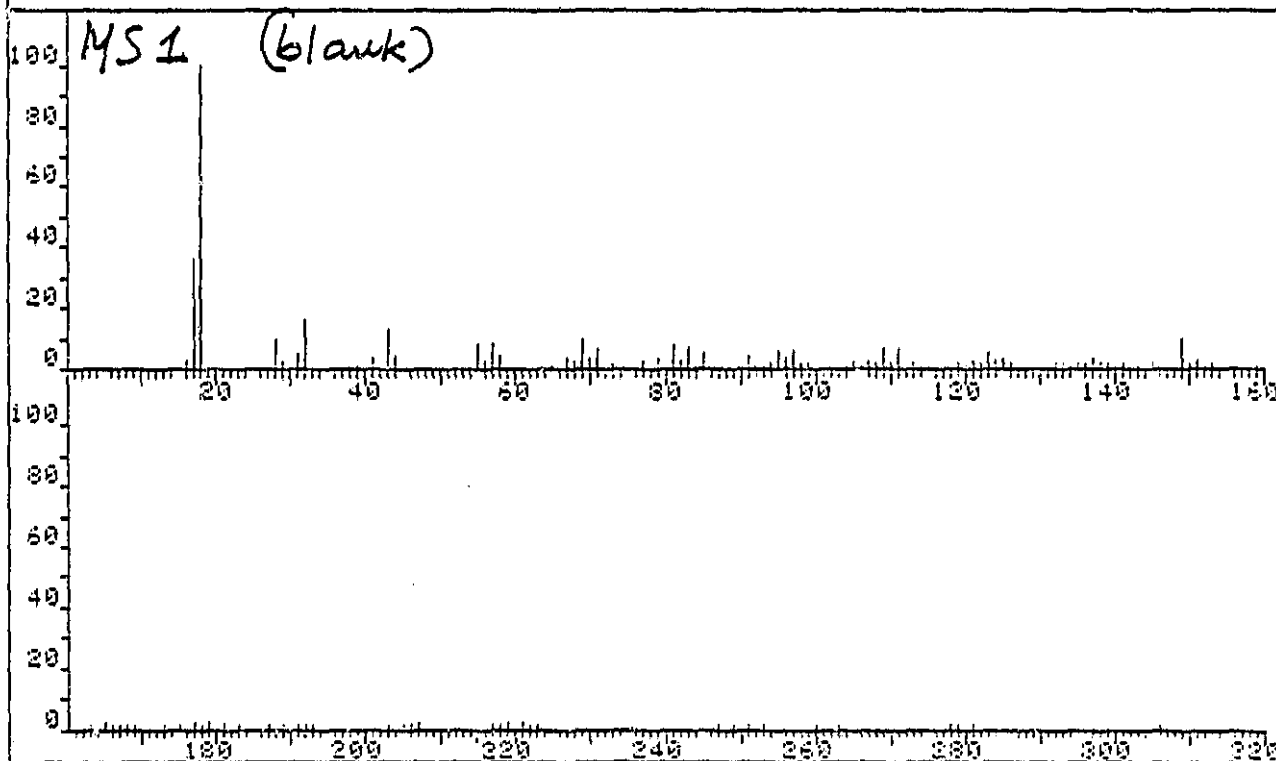
BLANK DIP-MS

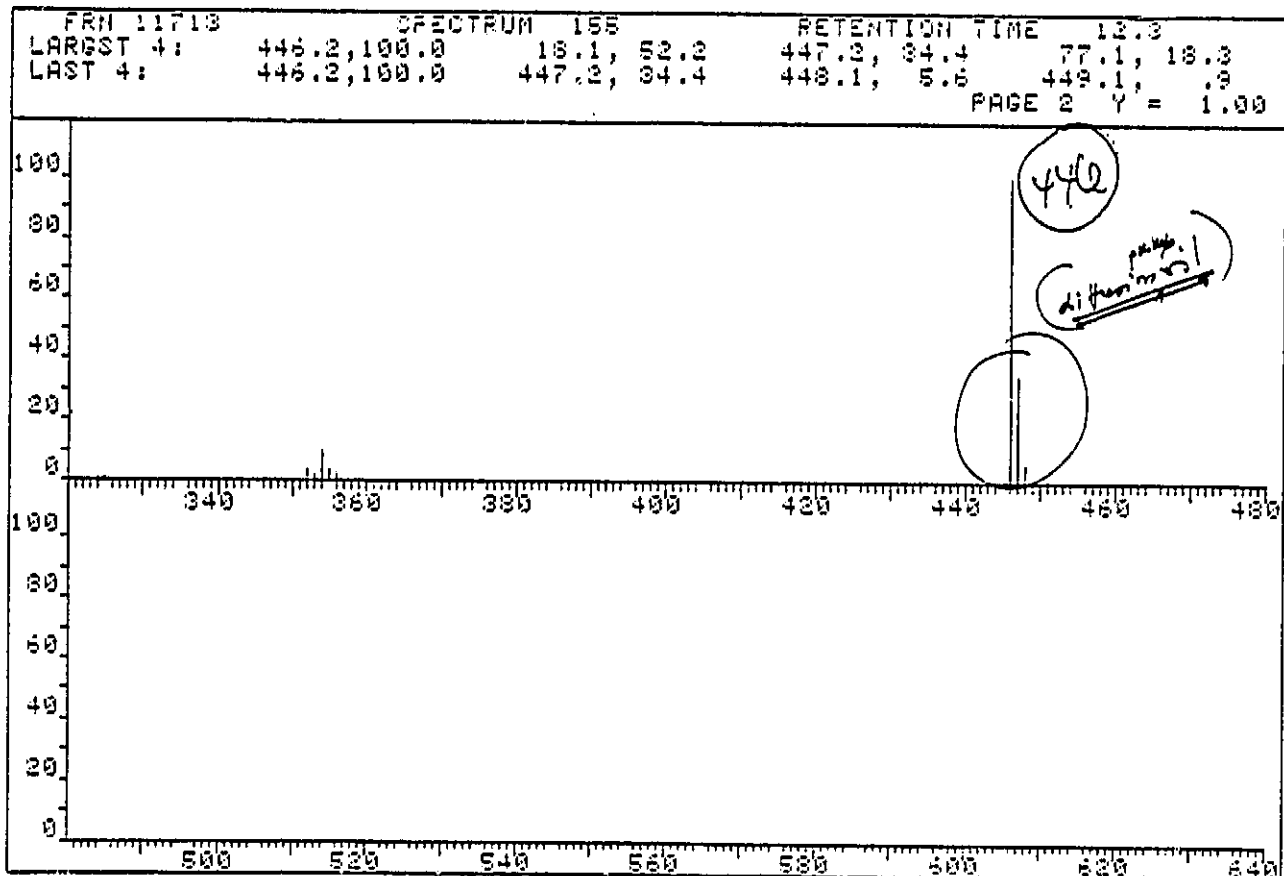
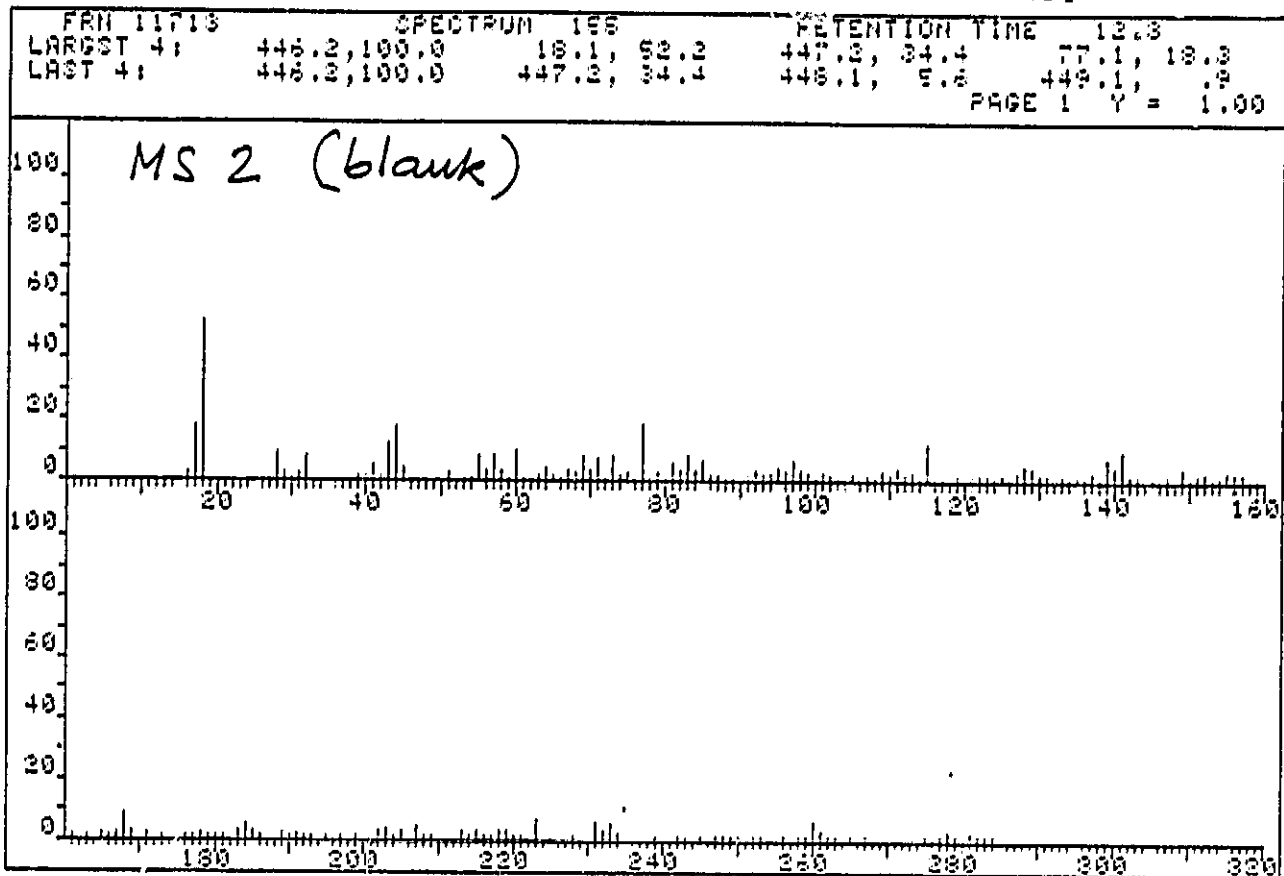
MS1

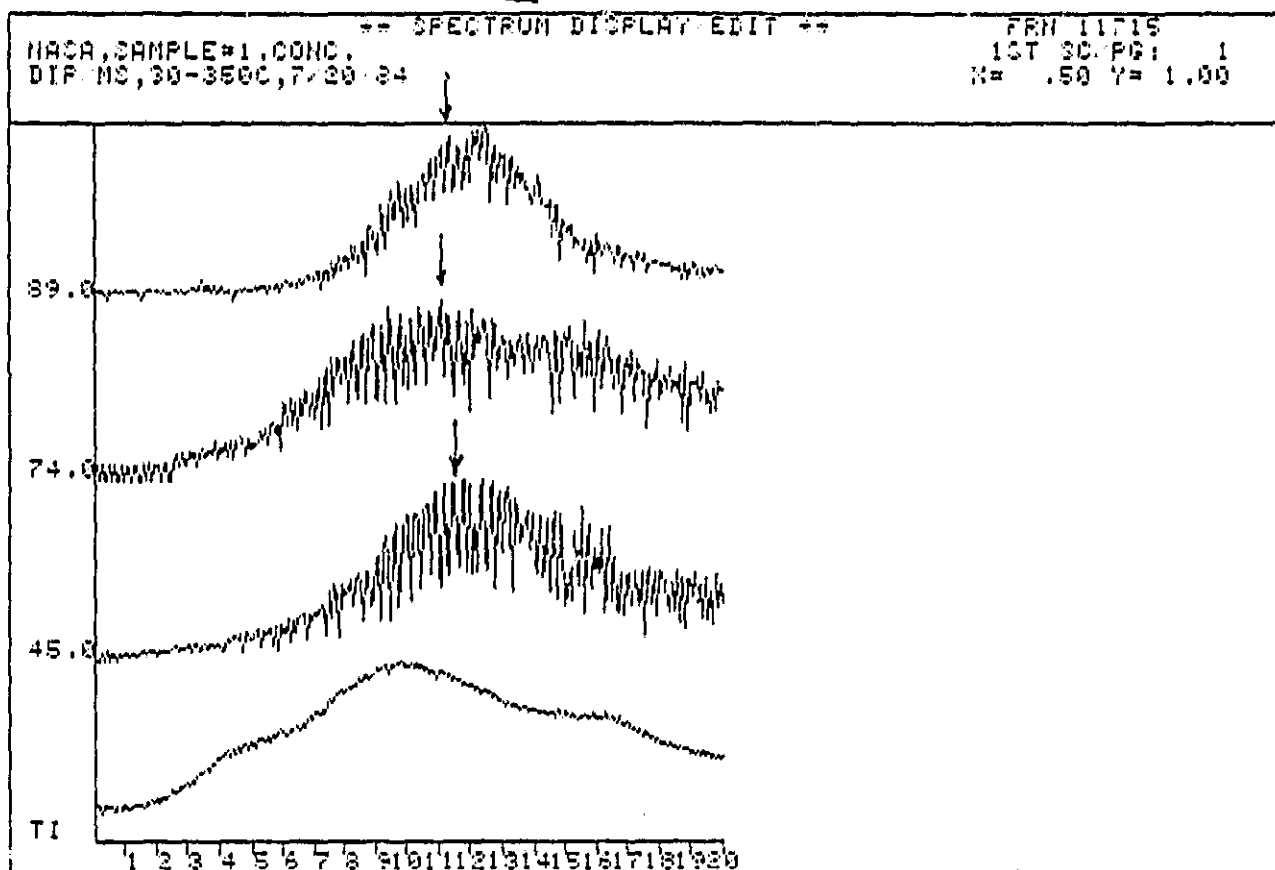


FRN 11713		SPECTRUM 48		RETENTION TIME 3.7	
LARGST 4:	18.1, 100.0	17.1, 36.7	32.1, 16.0	43.1, 12.8	
LAST 4:	340.4, 1.0	354.2, 1.0	355.2, 1.4	446.2, 2.4	
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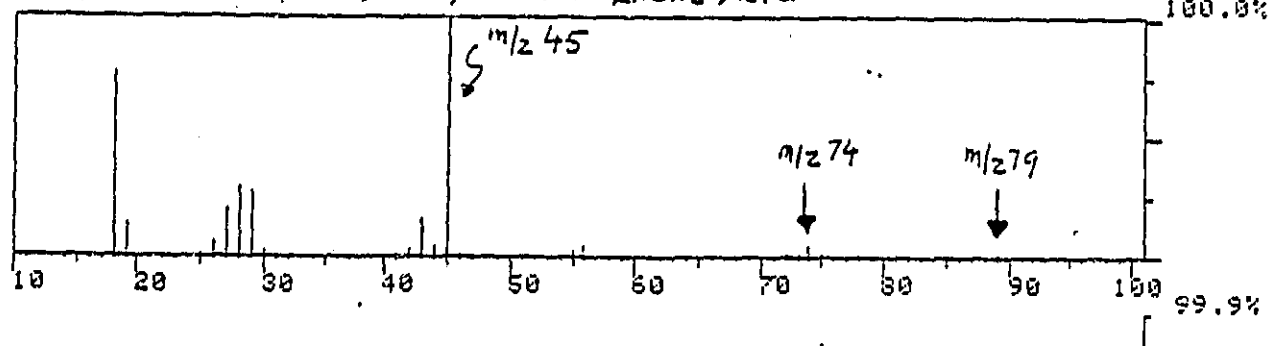
MS1 (blank)

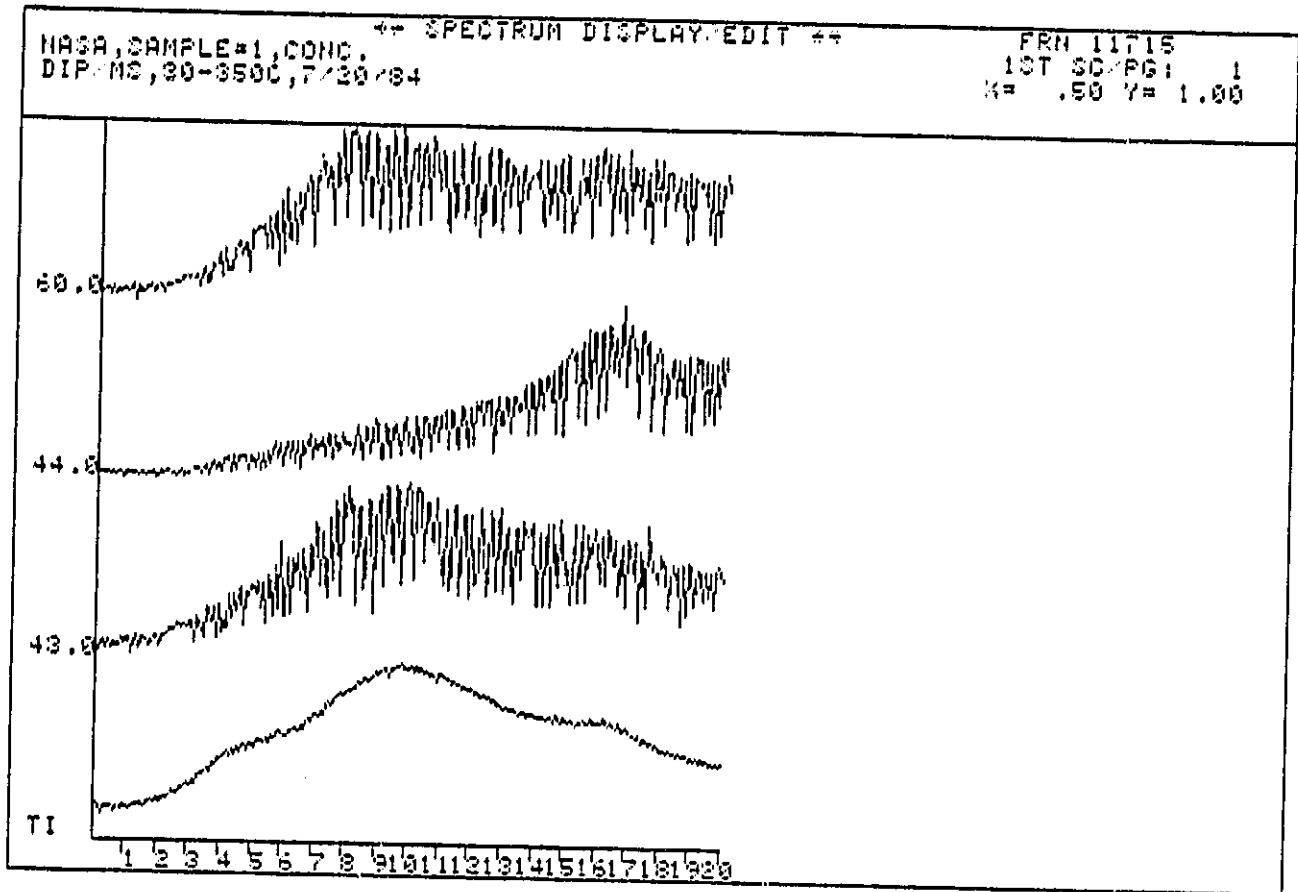




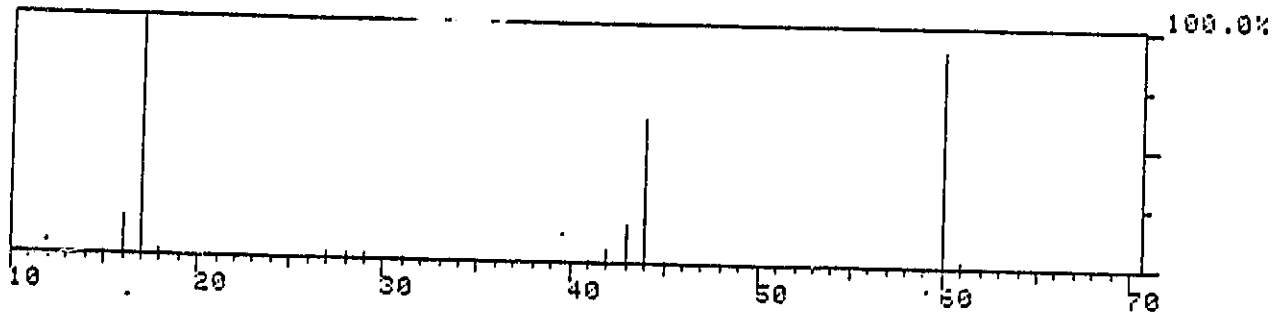


FRN 3001 SPECTRUM 699 MW= 90 C₃H₆O₃
Propanoic acid, 2-hydroxy- (9CI) LACTIC ACID

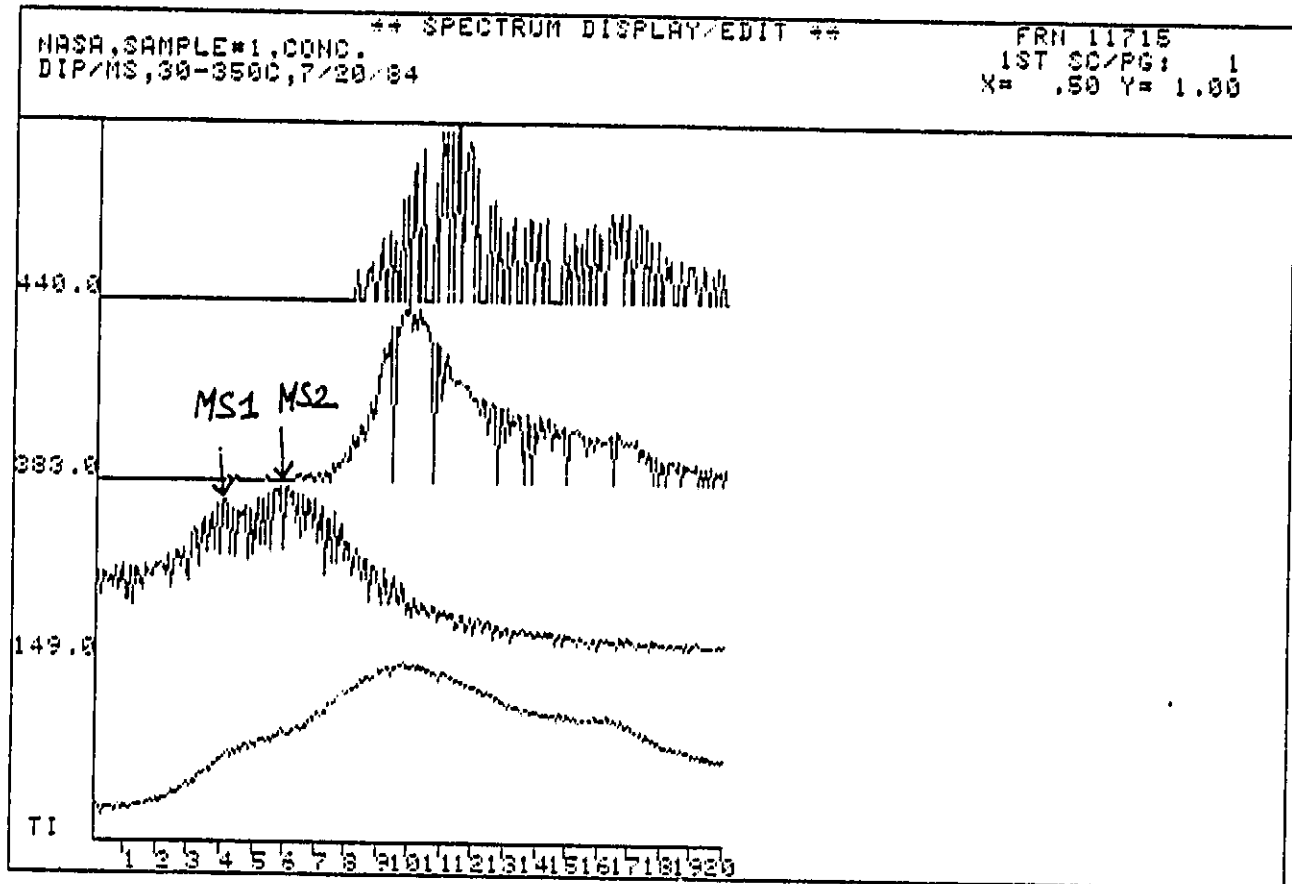




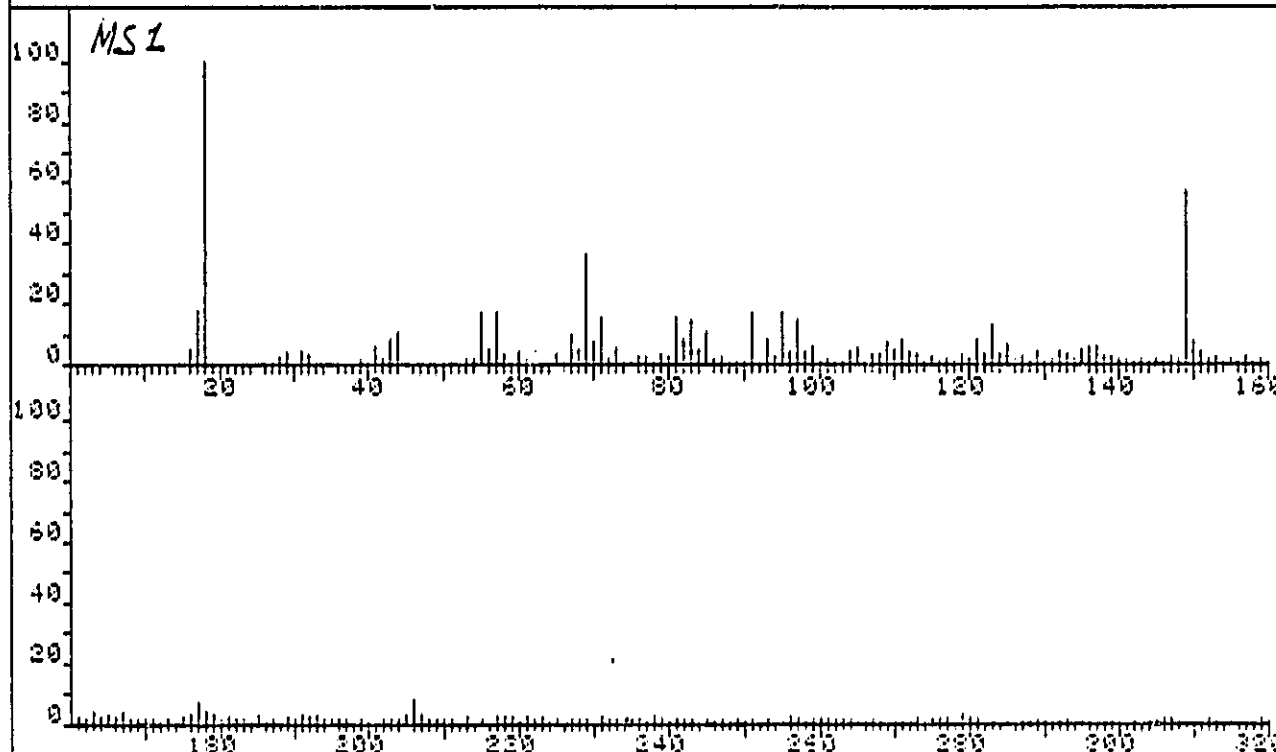
FRN 3001 SPECTRUM
Urea (8CI9CI)



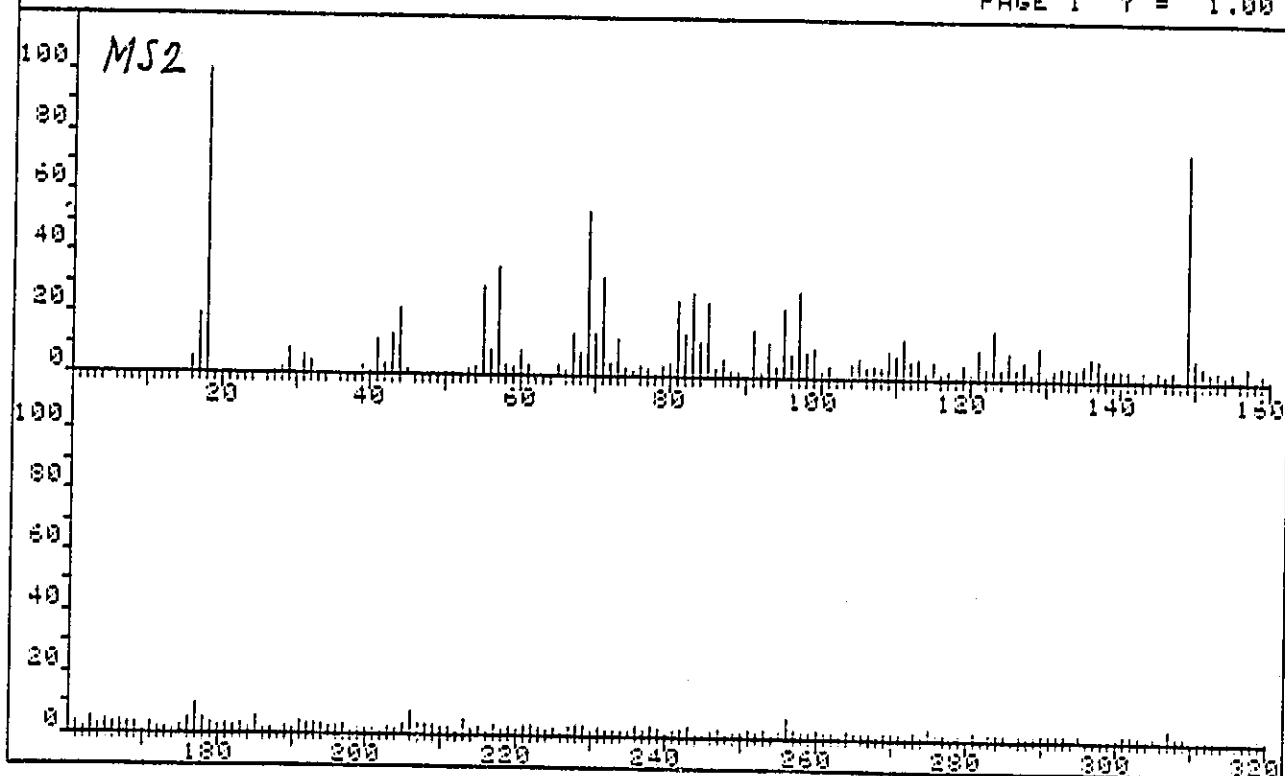
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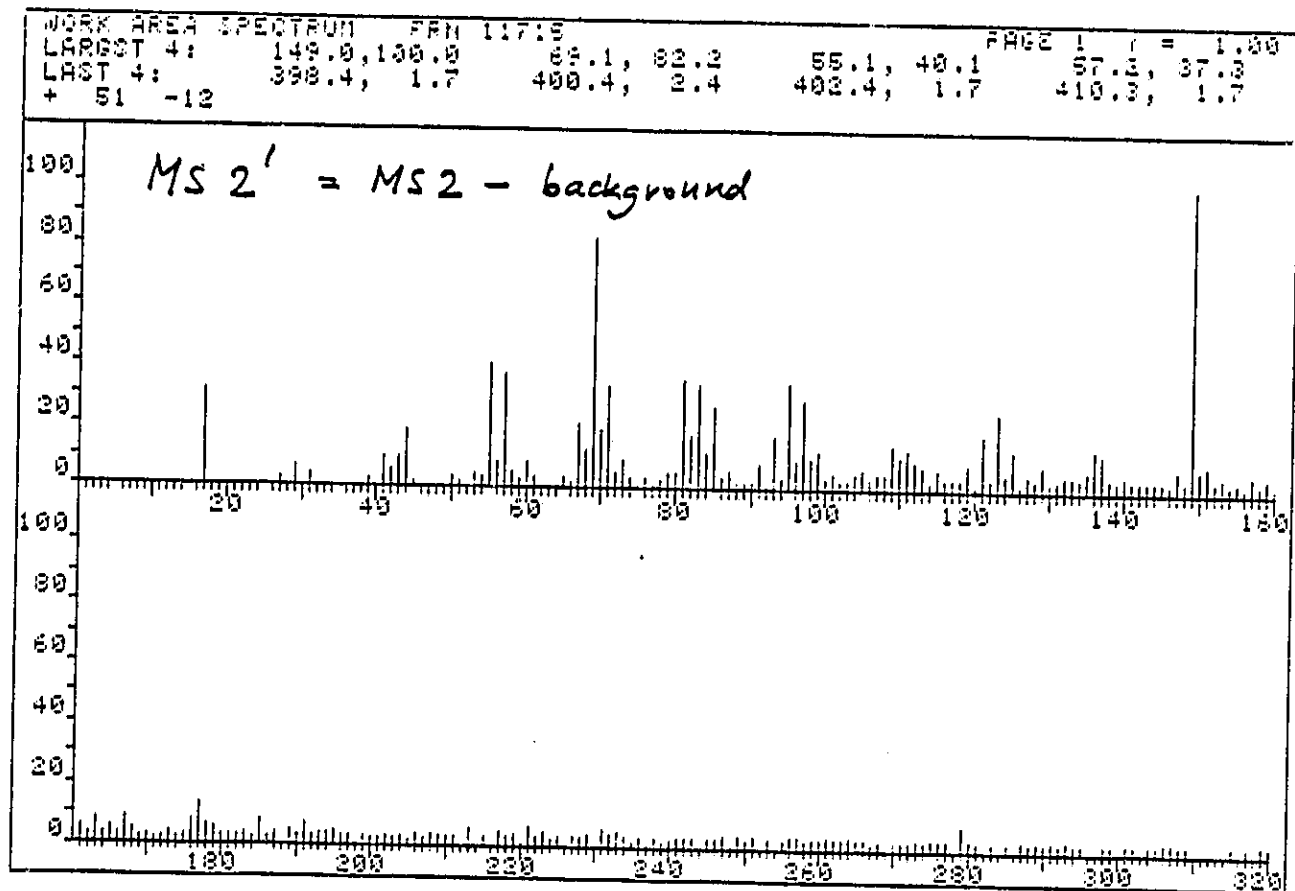
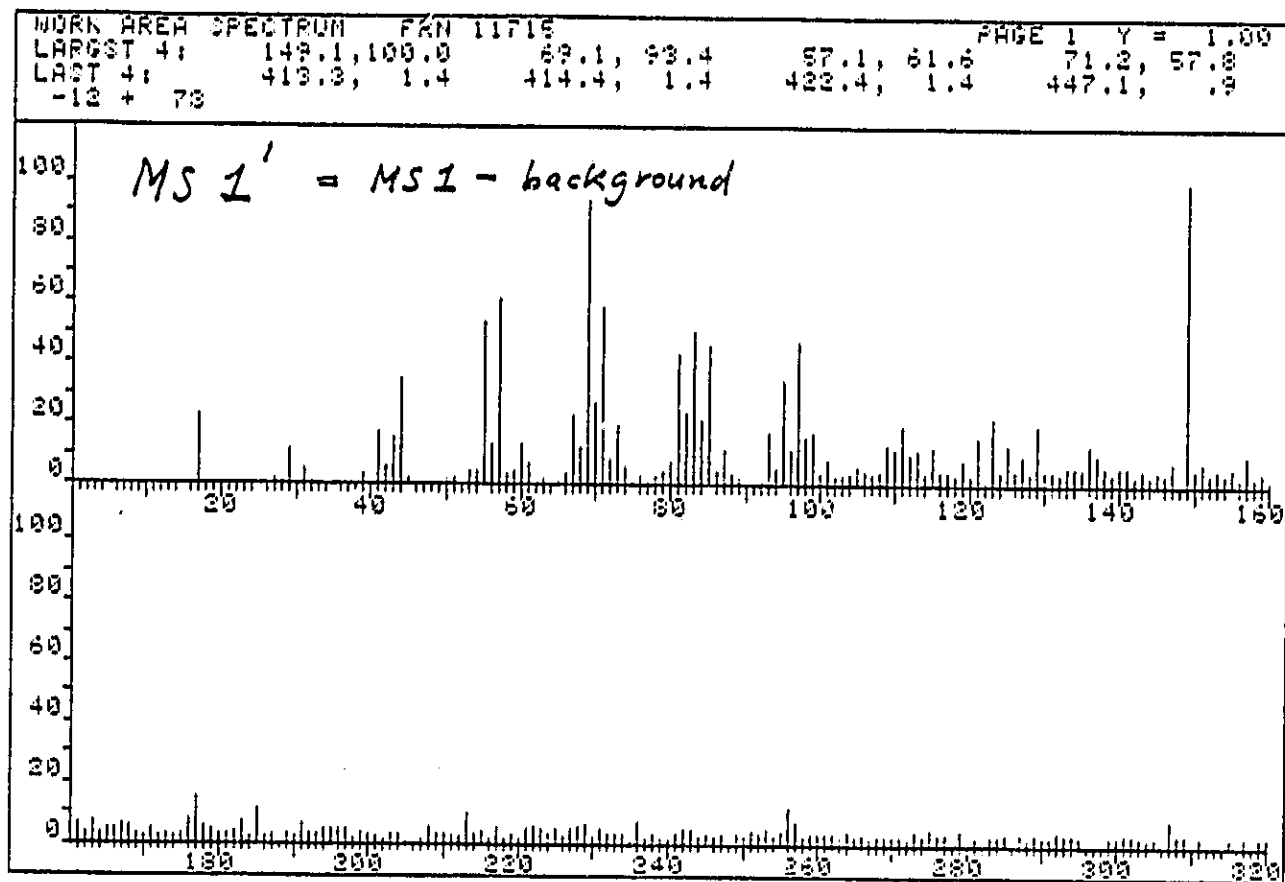


FRN 11715 SPECTRUM 51 RETENTION TIME 4.1
LARGST 4: 18.2, 100.0 149.0, 57.6 59.1, 35.1 17.0, 18.2
LAST 4: 402.4, .6 410.3, .6 416.3, 1.3 447.1, .6
PAGE 1 Y = 1.00



FRN 11715 SPECTRUM 73 RETENTION TIME 5.9
LARGST 4: 18.2, 100.0 148.9, 74.7 59.1, 54.0 57.2, 35.0
LAST 4: 414.4, .7 422.4, .7 446.0, 1.6 447.3, 1.1
PAGE 1 Y = 1.00





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MS1' FRN 11715 -12 +73 332 PEAKS, 319 SIGNIFICANT MP: 1 27.2

.9793 + Condurfolan-15-carboxylic acid, 2,15-didehydron-, methyl ester
 , 4-oxide (9CI)
 SPEC= 259 LSN= 24829. MW= 340 C20H24N2O3
 FRN = 3017 [NBS 24831.1 CAS # 0040159695 EPA # 0000032095
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 228
 23.1 10 4% .0 0 0% .0 0 0% MULTIPLIER= .31

.9792 Cyclohexane, (2-decyldodecyl)- (9CI)
 SPEC= 2639 LSN= 27209. MW= 392 C28H56
 FRN = 3017 [NBS 27212.1 CAS # 0005704002 EPA # 0000016846
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 694
 22.6 10 12% .0 0 0% .0 0 0% MULTIPLIER= .55

.9787 + 4H,5aH,9H-Furo[2,3-b]furo[3',2':2,3]cyclopenta[1,2-c]furan-2
 ,4,7(3H,8H)-trione, 9-(1,1-dimethylethyl)-10,10a-dihydro-8,9
 -dihydroxy-, [5aS-(3aR*,
 SPEC= 3461 LSN= 23953. MW= 326 C15H18O8
 FRN = 3014 [NBS 23955.1 CAS # 0033570046 EPA # 0000028224
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 379
 22.8 10 4% .0 0 0% .0 0 0% MULTIPLIER= .46

.9785 + 6,10,14-Hexadecatrienoic acid, 3,7,11,15-tetramethyl-, methyl
 ester, [R-(E,E)]- (9CI)
 SPEC= 3194 LSN= 23686. MW= 320 C21H36O2
 FRN = 3014 [NBS 23688.1 CAS # 0036237726 EPA # 0000029260
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
 22.6 10 10% .0 0 0% .0 0 0% MULTIPLIER= .95

.9783 + 1,3-Dicyclododecanedione, 2-octyl- (9CI)
 SPEC= 2337 LSN= 22829. MW= 308 C20H36O2
 FRN = 3014 [NBS 22831.1 CAS # 0029550150 EPA # 0000032956
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 446
 22.6 10 4% .0 0 0% .0 0 0% MULTIPLIER= .35

.9782 + Nonadecane, 2,6,10,14-tetramethyl- (9CI)
 SPEC= 3429 LSN= 23921. MW= 324 C23H48
 FRN = 3014 [NBS 23923.1 CAS # 0055124006 EPA # 0000015195
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 434
 22.3 10 4% .0 0 0% .0 0 0% MULTIPLIER= .38

.9781 1,2-Octadecanediol (9CI9CI)
 SPEC= 717 LSN= 21209. MW= 286 C18H38O2
 FRN = 3014 [NBS 21211.1 CAS # 0020294762 EPA # 0000013775
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 639
 22.6 10 20% .0 0 0% .0 0 0% MULTIPLIER= .72

.9781 + 6,10,14-Hexadecatrien-1-ol, 3,7,11,15-tetramethyl-, [R-(E,E)]
 1- (9CI)
 SPEC= 1193 LSN= 21685. MW= 292 C20H36O
 FRN = 3014 [NBS 21687.1 CAS # 0036237668 EPA # 0000029261
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
 22.6 10 12% .0 0 0% .0 0 0% MULTIPLIER= 1.09

.9781 + Tetracosane (9CI9CI)
 SPEC= 186 LSN= 24756. MW= 338 C24H50
 FRN = 3017 [NBS 24758.1 CAS # 0000646311 EPA # 0000015595
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
 22.0 10 13% .0 0 0% .0 0 0% MULTIPLIER= .98

.9780 Hexadecane, 1-iodo- (9CI9CI)
 SPEC= 841 LSN= 25411. MW= 352 C16H33I
 FRN = 3017 [NBS 25414.1 CAS # 0000544774 EPA # 0000015978
 MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
 21.8 10 11% .0 0 0% .0 0 0% MULTIPLIER= .73

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FRN 11715 + 51 -12 -12 + 51

MS2'

312 PEAKS, 306 SIGNIFICANT MAX R 27.3

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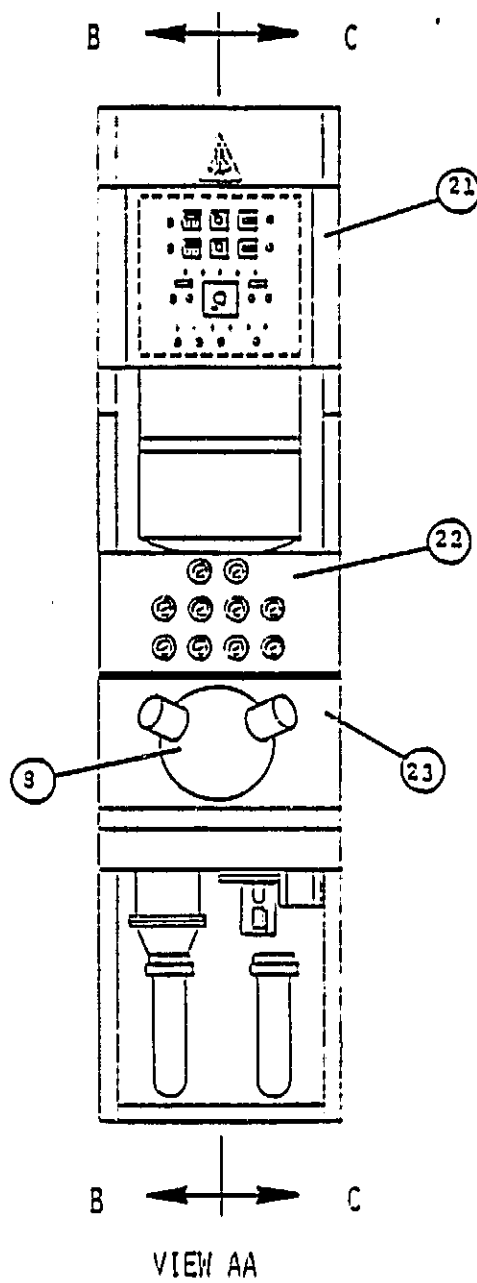
- .9802 + 4H-1-Benzopyran-4-one, 2-(3,4-dimethoxyphenyl)-3,5-dihydroxy-
-7-methoxy- (9CI)
SPEC= 440 LSN= 25010. MW= 344 C18H16O7
FRN = 3017 [NBS 25013.] CAS # 000606000 EPA # 0000043865
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 0
24.3 10 4% .0 0 0% .0 0 0% MULTIPLIER= .32
- .9793 + Cholestan-3-ol, 2-methylene-, (3.beta.,5.alpha.)- (9CI)
SPEC= 2968 LSN= 27538. MW= 400 C28H48O
FRN = 3017 [NBS 27541.] CAS # 002259968 EPA # 0000048741
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 577
22.7 10 14% .0 0 0% .0 0 0% MULTIPLIER= .42
- .9786 + 6,10,14-Hexadecatrienoic acid, 3,7,11,15-tetramethyl-, methyl
ester, [R-(E,E)]- (9CI)
SPEC= 3194 LSN= 23686. MW= 320 C21H36O2
FRN = 3014 [NBS 23688.] CAS # 0036237726 EPA # 0000029260
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
22.9 10 11% .0 0 0% .0 0 0% MULTIPLIER= .77
- .9785 + 8,12-Tetradecadienoic acid, 5-ethenyl-3,5,9,13-tetramethyl-,
methyl ester (9CI)
SPEC= 3195 LSN= 23687. MW= 320 C21H36O2
FRN = 3014 [NBS 23689.] CAS # 0036237737 EPA # 0000029262
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
22.7 10 11% .0 0 0% .0 0 0% MULTIPLIER= .47
- .9784 + Hexanoic acid, 6,6'-diselenodi- (8CI)
SPEC= 2517 LSN= 27087. MW= 390 C12H22O4Se2
FRN = 3017 [NBS 27090.] CAS # 0022676353 EPA # 0000032749
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 626
21.8 9 0% .0 0 0% .0 0 0% MULTIPLIER= .41
- .9781 + 6,10,14-Hexadecatrien-1-ol, 3,7,11,15-tetramethyl-, [R-(E,E)]-
]- (9CI)
SPEC= 1193 LSN= 21685. MW= 292 C20H36O
FRN = 3014 [NBS 21687.] CAS # 0036237668 EPA # 0000029261
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 655
22.7 10 14% .0 0 0% .0 0 0% MULTIPLIER= 1.02
- .9779 Pentane, octahydro-1-(2-octyldecyl)- (9CI)
SPEC= 1405 LSN= 25975. MW= 362 C26H50
FRN = 3017 [NBS 25978.] CAS # 0055401655 EPA # 0000023513
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 729
21.6 10 15% .0 0 0% .0 0 0% MULTIPLIER= .40
- .9773 Decane, 4,5-dibromo-, (R*,R*)- (9CI)
SPEC= 1541 LSN= 22033. MW= 298 C10H20Br2
FRN = 3014 [NBS 22035.] CAS # 0061141706 EPA # 0000045333
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 728
21.8 10 15% .0 0 0% .0 0 0% MULTIPLIER= .81
- .9773 1-Naphthalenepentanoic acid, 6-(acetyloxy)decahydro-2-hydroxy-
y-.beta.,2,5,5,8a-pentamethyl-, methyl ester, [1S-[1.alpha.(
S*),2.beta.,4a.beta.,6.a
SPEC= 2755 LSN= 27325. MW= 396 C23H40O5
FRN = 3017 [NBS 27328.] CAS # 0052567621 EPA # 0000031496
MATCHING PEAKS CONTAMINATED MISSING PEAKS QUAL INDEX= 60
20.7 9 4% .0 0 0% .0 0 0% MULTIPLIER= .33

APPENDIX

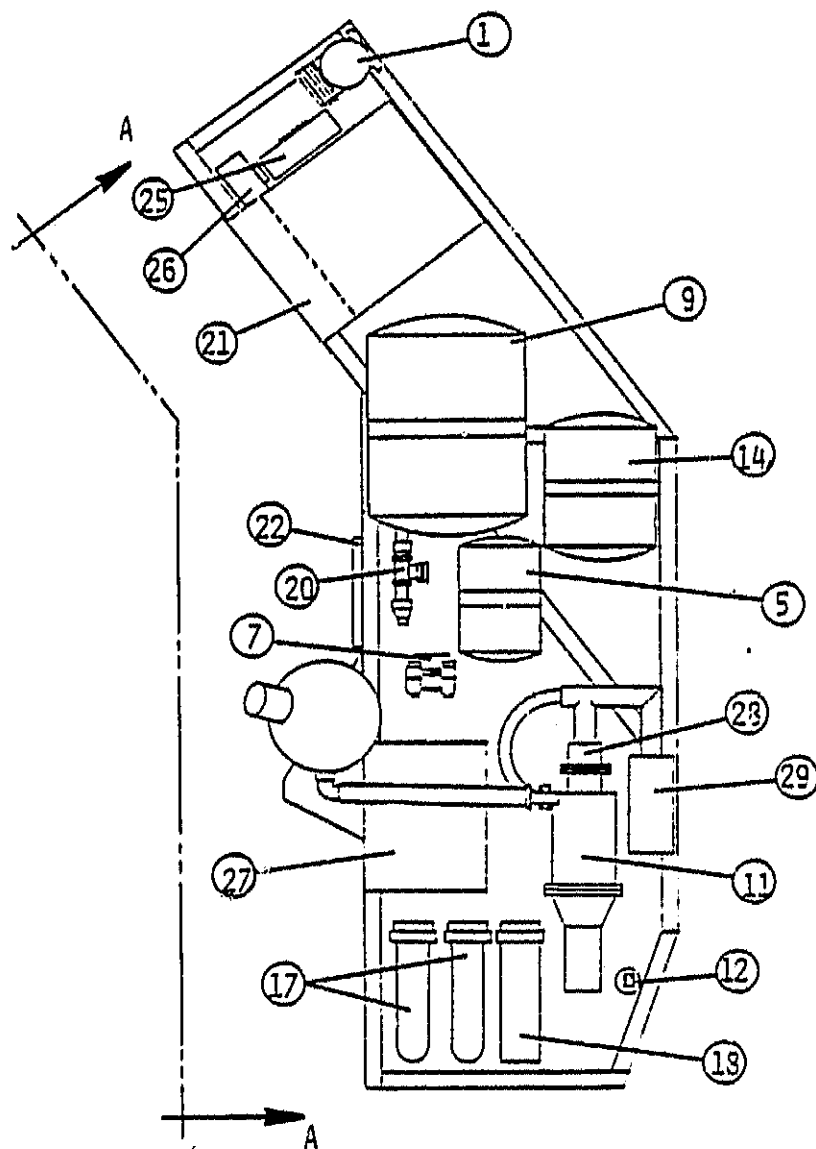
SUMMARY LIST 9

PARTS LIST & FIGURES

<u>Parts List</u>	<u>Figure</u>	<u>Description</u>
1	7	Prototype Major Components Front View
1	7A	Prototype Right Side View
1	8	Prototype Left Side View
2	9	Control Components
2	9A	SUHCF Wiring Diagram
3	10	Air Supply System
4	11	Soap and FeCl_3 System
5	12	Water Supply System
6	13	Mixing System
7	14	Waste Water System
8	15	Filter System
	16	Wiring Diagram
	17	Wiring Diagram
	18	Mixing Tank
	19	Waste Tank
	20	Prototype Frame
	21	Demonstration Hand Washing PWWRS/SUHCF Prototype
	22	PWWRS/SUHCF Recharging System
	23	Rear View PWWRS/SUHCF Sampling Valves at Top Mixing Tank and Deareator
	24	CP 162 Chassis
	25	Wiring Diagram



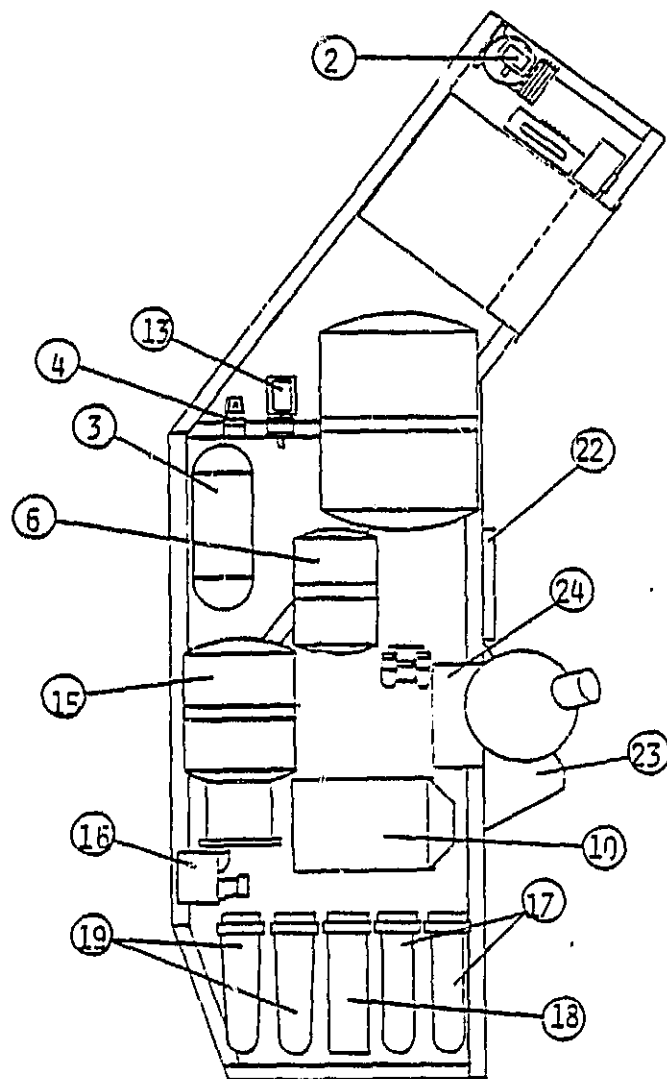
PWWRS/SUHCF MAJOR COMPONENTS
FRONT VIEW
FIGURE 7



VIEW BB

PWWRS/SUHCF
RIGHT SIDE VIEW

FIGURE 7A



VIEW CC

PWWRS/SUHCF
LEFT SIDE VIEW

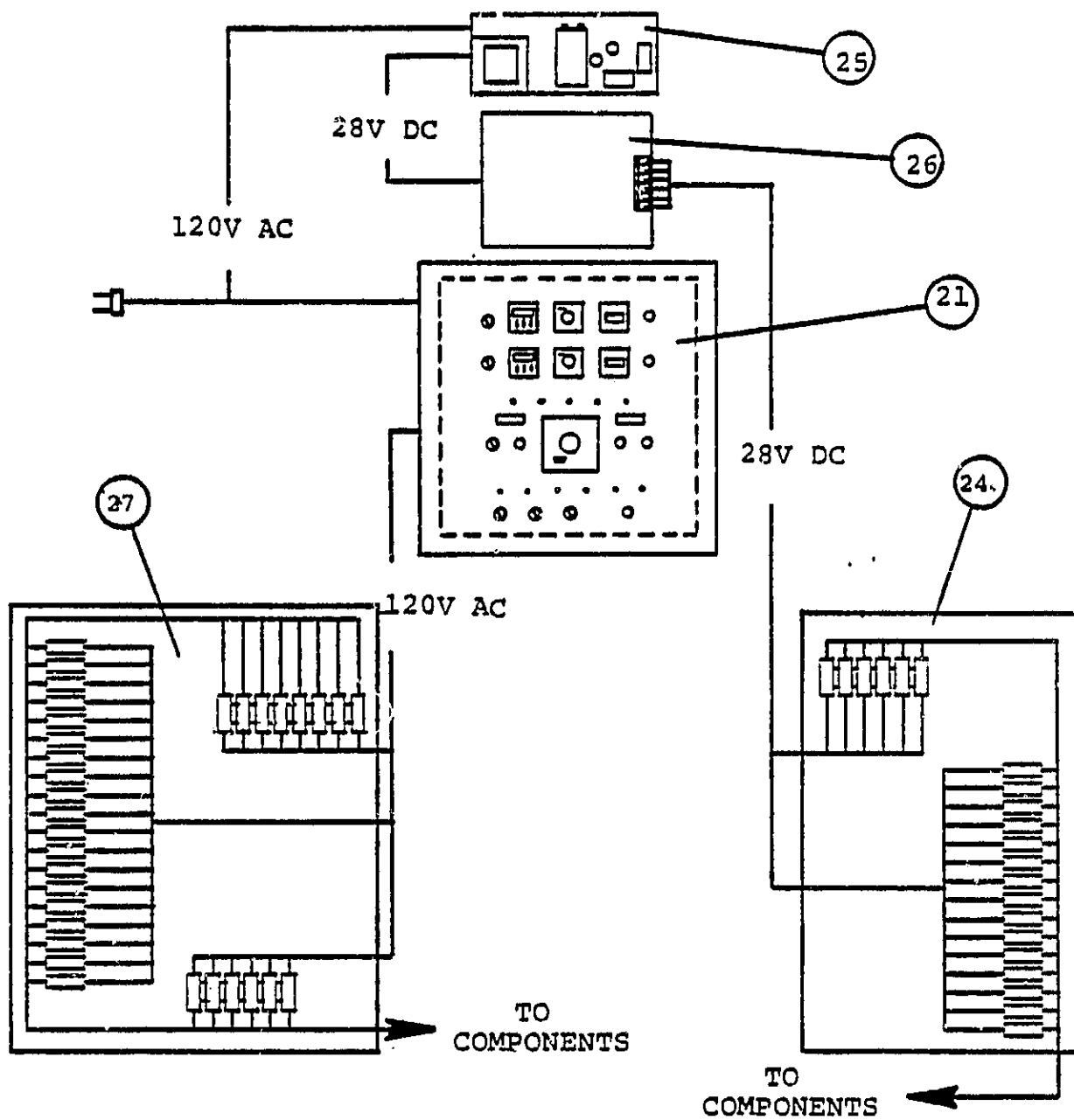
FIGURE 8

Number	Part
1	Air Compressor
2	Pressure Switch
3	Air Storage Tank
4	Air Regulator
5	FeCl ₃ Tank (2 gal. capacity)
6	Soap Tank (2 gal. capacity)
7	Dispense Valve
8	Hand Washing Enclosure
9	Supply Tank
10	SUICF Water Heater
11	Liquid Gas Separator
12	Sump Pump
13	Pressure Switch
14	Waste Tank
15	Mixing Tank
16	Motor Actuated Ball Valve
17	String Filters
18	Ion Exchangers
19	Charcoal Filters
20	Conductivity Sensor
21	PWWRS Control Panel
22	Pressure Gage Panel
23	SUICF Control Panel
24	SUICF Valve Plate & Terminal Board
25	SUICF Control Plan
26	SUICF Power Supply
27	PWWRS Valve Plate & Terminal Board
28	SUICF Air Blow
29	SUICF Charcoal Filter

PARTS LIST - MAJOR COMPONENTS

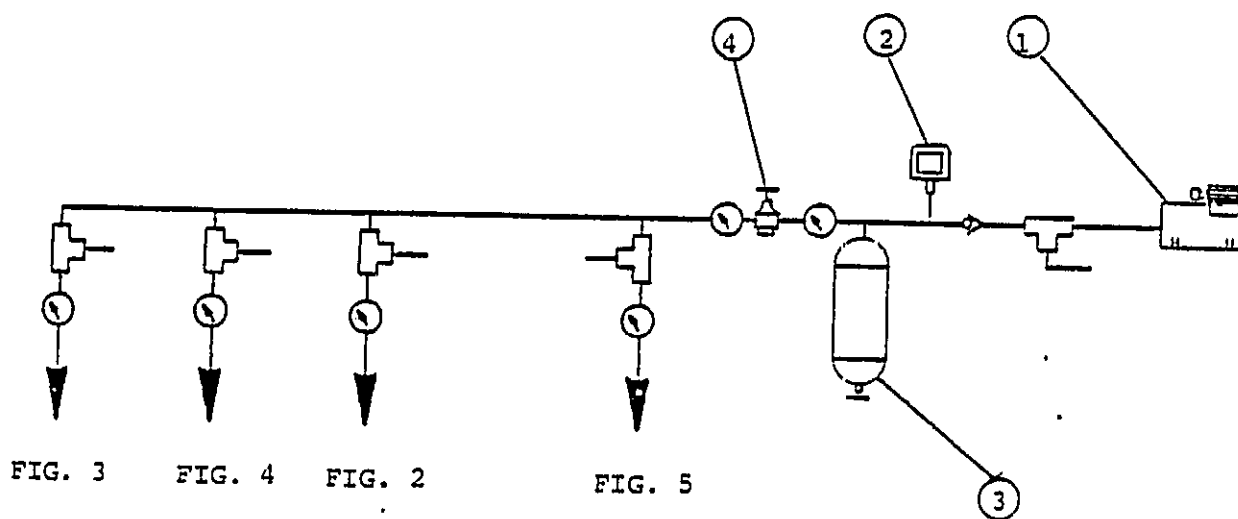
FOR FIGURES 7, 7A, 8

LIST 1



CONTROL COMPONENTS

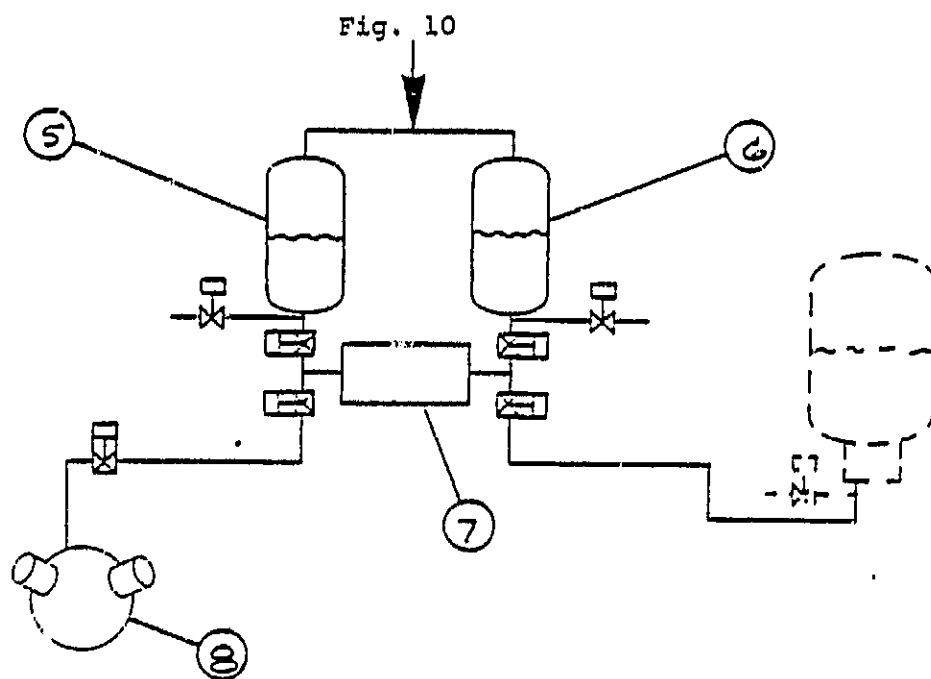
FIGURE 9



AIR SUPPLY SYSTEM
FIGURE 10

PART NO.	DESCRIPTION	MATERIAL	QTY.
1	Thomas Compressor 607CE40		1
	6-32 Soc. HD. Cap Screws	Steel	4
	Check Valve 1/4 NPT Parker	Stainless Steel	1
	6-4 CBZ Fitting Parker	Stainless Steel	2
	4-4 FHC Parker	Stainless Steel	1
	Skinner BB 3-Way Valve	Stainless Steel	5
	Valve Manifold	Brass	1
	Close Nipple 1/4" NPT	Stainless Steel	3
	Coupling 1/4" NPT	Stainless Steel	1
2	Square "D" Pumpcroll Pressure Switch No. FHG-12		
	Mounting Bracket	Aluminum	1
	Cable Set, Screw Connector	Aluminum	2
	1/4-20 Soc. HD. Cap Screws	Steel	2
	4-4-4 Ft. Fitting Parker	Stainless Steel	2
3	2-Gallon Air Storage Tank TTT Nunome - Bigger Back Tank	Steel	1
	Modified Unistrut Pipe Strap 2062-30D	Steel	1
	Petcock 1/8 NPT	Brass	1
	Pressure Regulator Watts Model 4R-364-02	Brass	1
	0-30 Psi Helicoid #3505-1 Gage	Brass	6
	6-4 FBZ Fitting Parker	Stainless Steel	5
	6-2 FBZ Fitting Parker	Stainless Steel	9
	6-2 DBZ Fitting Parker	Stainless Steel	6
	6-2 CBZ Fitting Parker	Stainless Steel	1
	6-6-4 RBZ Fitting Parker	Stainless Steel	1
	6-6-6 JBZ Fitting Parker	Stainless Steel	7
	6-2 TWHZBZ Fitting Parker	Stainless Steel	3
	Gould Imperial Eastman 66-P-3/8 Tubing	PT	A/R

PARTS LIST
AIR SUPPLY SYSTEM FIGURE 10
LIST 3



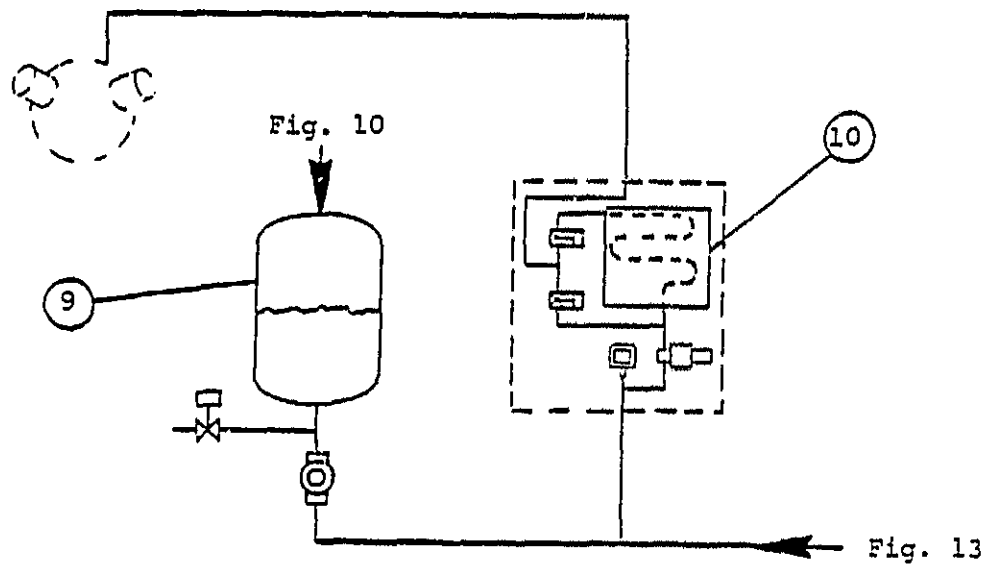
SOAP AND FeCl_3 SYSTEM
FIGURE 11

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PART NO.	DESCRIPTION	MATERIAL	QTY.
5	Well-X-Trol 101 STD (2 gal. cap.)	Steel	1
	1/4 to 1/4 NPT Coupling	Stainless Steel	1
	Modified SUHCF Tank Strap	Aluminum	2
	4-4-4 FC. Fitting Parker	Stainless Steel	1
	6-4 CBZ Fitting Parker	Stainless Steel	1
	4-4 FBZ Fitting Parker	Stainless Steel	1
	5/16 - 3/2 to 1/4 NPT Coupling	Stainless Steel	2
6	FeCl Whitey SS 4254 Ball Valve	Stainless Steel	1
	Well-X-Trol 101 Special (2 gal. cap.)	Stainless Steel Bushing	1
	Modified SUHCF Tank Strap	Aluminum	1
	Reducer Bushing 3/4-1/4 NPT	PVC	1
	10-24 SOC. Hd. Cap Screw	Steel	10
	Chem Cock Ball Valve	PVC	1
	P6MC4 Fitting Parker	PP	3
7	Dispensing Valve	Acrylic	1
	Dispensing Valve Bracket	Aluminum	1
	Female Pipe Tee 1/4 NPT	PVC	1
	Close Nipple 1/4 NPT	PVC	7
	6-4 FBZ Fitting Parker	Stainless Steel	2
	Macon Eolnoid Valves WNE	Teflon	4
	Skinner 32 2-Way Valve	Stainless Steel	1
8	SUHCF Hand Washing Enclosure	Acrylic	1
	SUHCF Hand Washing Enclosure Panel	Steel	1
	6-4 HBZ Fitting Parker	Stainless Steel	1
	4-4 CBZ Fitting Parker	Stainless Steel	1
	Gould Imperial Eastman 66-P-1/8 Tubing PE		A/R

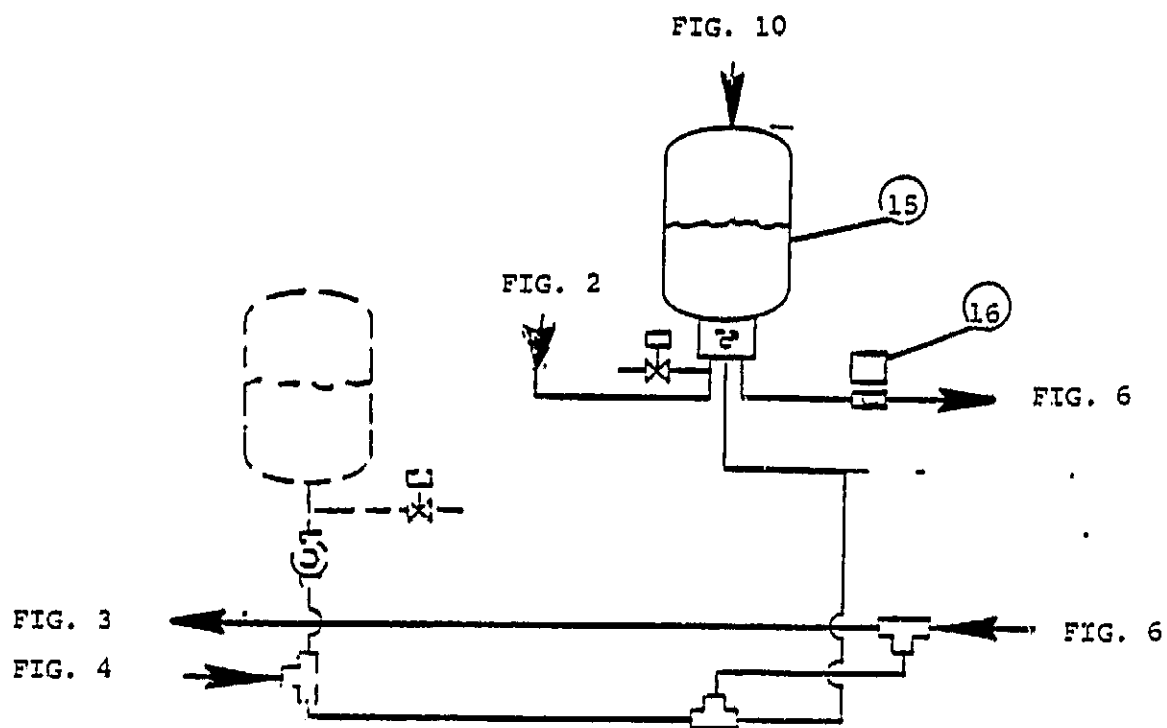
PARTS LIST
FOR SOAP AND FeCl_3 SYSTEM FIGURE 11

LIST 4

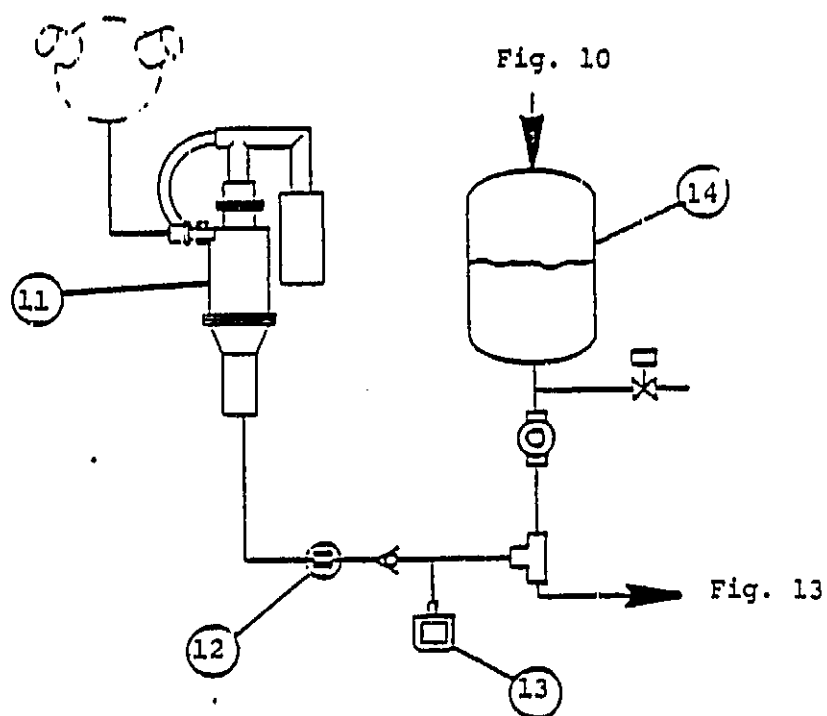


MICROBIAL CHECK VALVE GFE 80508

WATER SUPPLY SYSTEM
FIGURE 12



MIXING SYSTEM
FIGURE 13



WASTE WATER SYSTEM
FIGURE 14

PART NO.	DESCRIPTION	MATERIAL	QTY.
11	SUHC Liquid Gas Separator	Acrylic	1
	Liquid Level Control - SUHCF	NAS 9-15880	1
	SUHC Charcoal Filter	Aluminum	1
	3" Hose Clamp	Steel	5
	SUHC Air Blower	Steel	1
	SUHC Mounting Straps	Aluminum	2
12	Micro Pump Magnetic Drive #V30-106-0000	Aluminum	1
	Micro Pump Bracket	Aluminum	1
	1/4-20 SOC. HD. Cap Screw	Steel	4
	Swagelok Check Valve	Stainless Steel	1
	4-4 FBZ Fitting Parker	Stainless Steel	3
	4-4 CBZ Fitting Parker	Stainless Steel	2
	6-4 HBZ Fitting Parker	Stainless Steel	1
13	Square "D" Pressure Switch #9012		1
14	Well-X-Trol 102 Full Volume	(4.4 gal. capacity)	1
	Modified Unistrut Pipe Strap #2070R1	Steel	1
	SUHC Flow Indicator	Brass	1
	Skinner BB 3-Way Valve	Stainless Steel	1
	6-4 FBZ Fitting Parker	Stainless Steel	2
	6-4 CBZ Fitting Parker	Stainless Steel	1
	6-2 CBZ Fitting Parker	Stainless Steel	3
	6-6 BBZ Fitting Parker	Stainless Steel	1
	6-6-6 JBZ Fitting Parker	Stainless Steel	1
	5/16-32 to 1/4 NPT Coupling	Stainless Steel	1
	12-4 RB Fitting Parker	Stainless Steel	1
	Close Nipple 1/4 NPT	Stainless Steel	2
	6-6-6 Ft Fitting Parker	Stainless Steel	1
	Whitey SS4254 Ball Valve	Stainless Steel	1
	Gould Imperial Eastman 66-P-3/8 Tubing	PE	A/R

PARTS LIST
WASTE WATER SYSTEM FIGURE 14

LIST 7

ORIGINAL FROM SET
OF POOR QUALITY

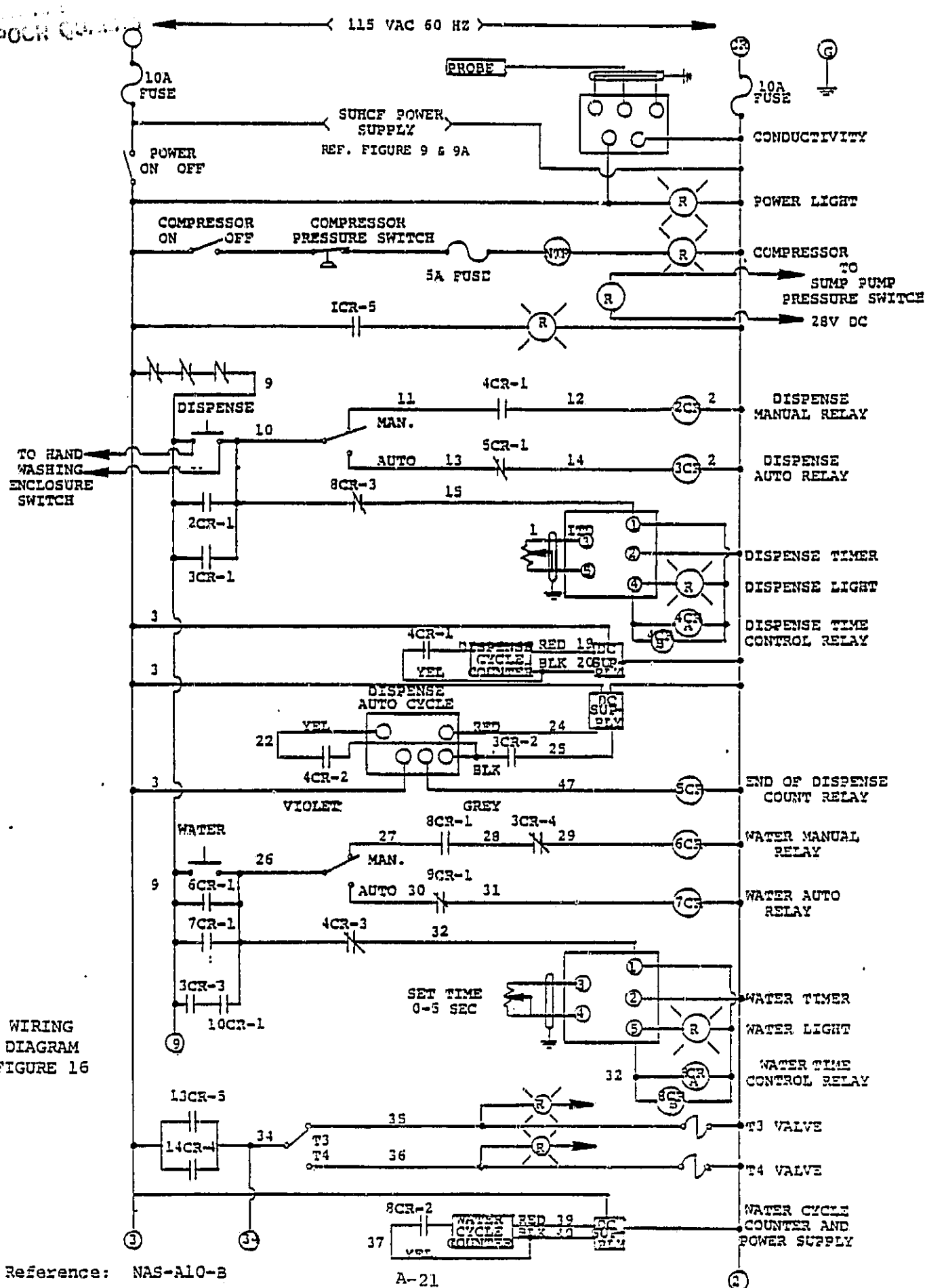
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PART NO.	DESCRIPTION	MATERIAL	QTY.
17	AMF Cuno Filter Housing #CT 101 3/4" NPT	4 4152-01 Stainless Steel & Brass	1
	AMF String Filter Cartridge Micro-Wynd 17	OPPPV	4
18	AMF Cuno Filter Housing #1M1 3/4" NPT	Plastic Acrylic/Styrene	2
	AMF Activated Carbon Cartridge	Cat. No. 46285-01	2
19	AMF Cuno Panfield Water Conditioner Housing		2
	AMF Ion Exchange Resin Ref. Model SM04010 Damineralizer		2 Bags
	Filter Manifold	Aluminum	1
	Shaw-Walker Draw Slide	Steel	1 Pair
	1/4-20 Soc. Hd. Cap Screw	Steel	34
	6-2 CBZ Fitting Parker	Stainless Steel	16
	12-4 RB Fitting Parker	Stainless Steel	16
	6-6-6 JBZ Fitting Parker	Stainless Steel	15
	Skinner B2 2-Way Valve	Stainless Steel	6
	6-2 FBZ Fitting Parker	Stainless Steel	9
	6-2 CBZ Fitting Parker	Stainless Steel	4
	6-2 T2H2BZ Fitting Parker	Stainless Steel	4
	Valve Manifold	Brass	1
	Parker Vall Valve #172F	Stainless Steel	5
	0-30 Psi Helioid Gages #3505-1	Brass	4
20	Leeds & Northrup Conductivity Cell Catalog 7086-1-7-000	Plastic	1
	Female Pipe Tee 3/4 NPT	Brass	1
	2" Nipple 3/4 NPT	Brass	1
	12-4 RB Fitting Parker	Stainless Steel	1
	Coupling 3/4 to 1/2 NPT	Brass	1
	Reducer Bushing 1/2 to 1/4 NPT	PP	1
	6-4 CBZ Fitting Parker	Stainless Steel	1
	6-6-4 RBZ Fitting Parker	Stainless Steel	1
	6-4 DBZ Fitting Parker	Stainless Steel	4

PARTS LIST
FILTER SYSTEM FIGURE 15

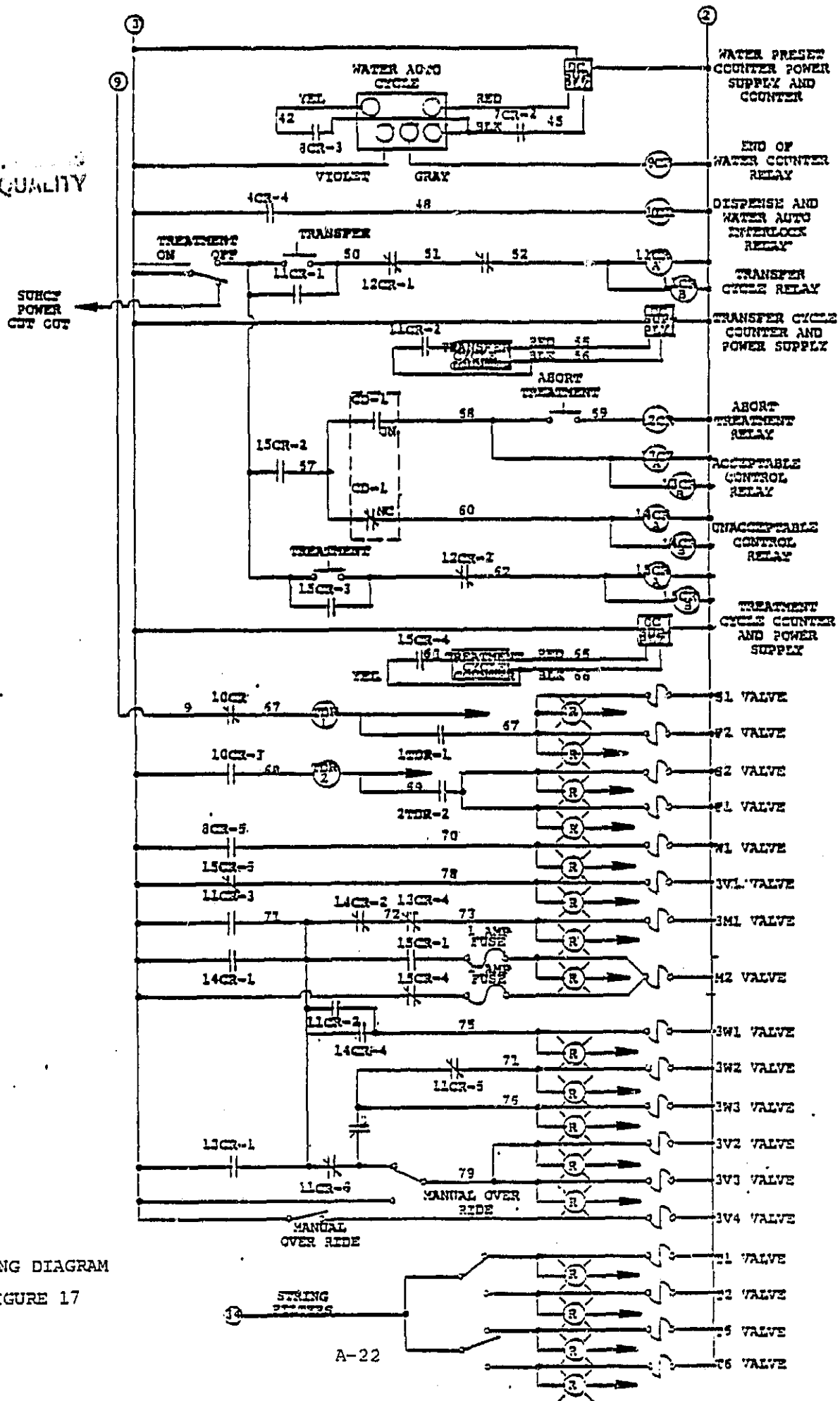
LIST 8

OF POOR QUALITY



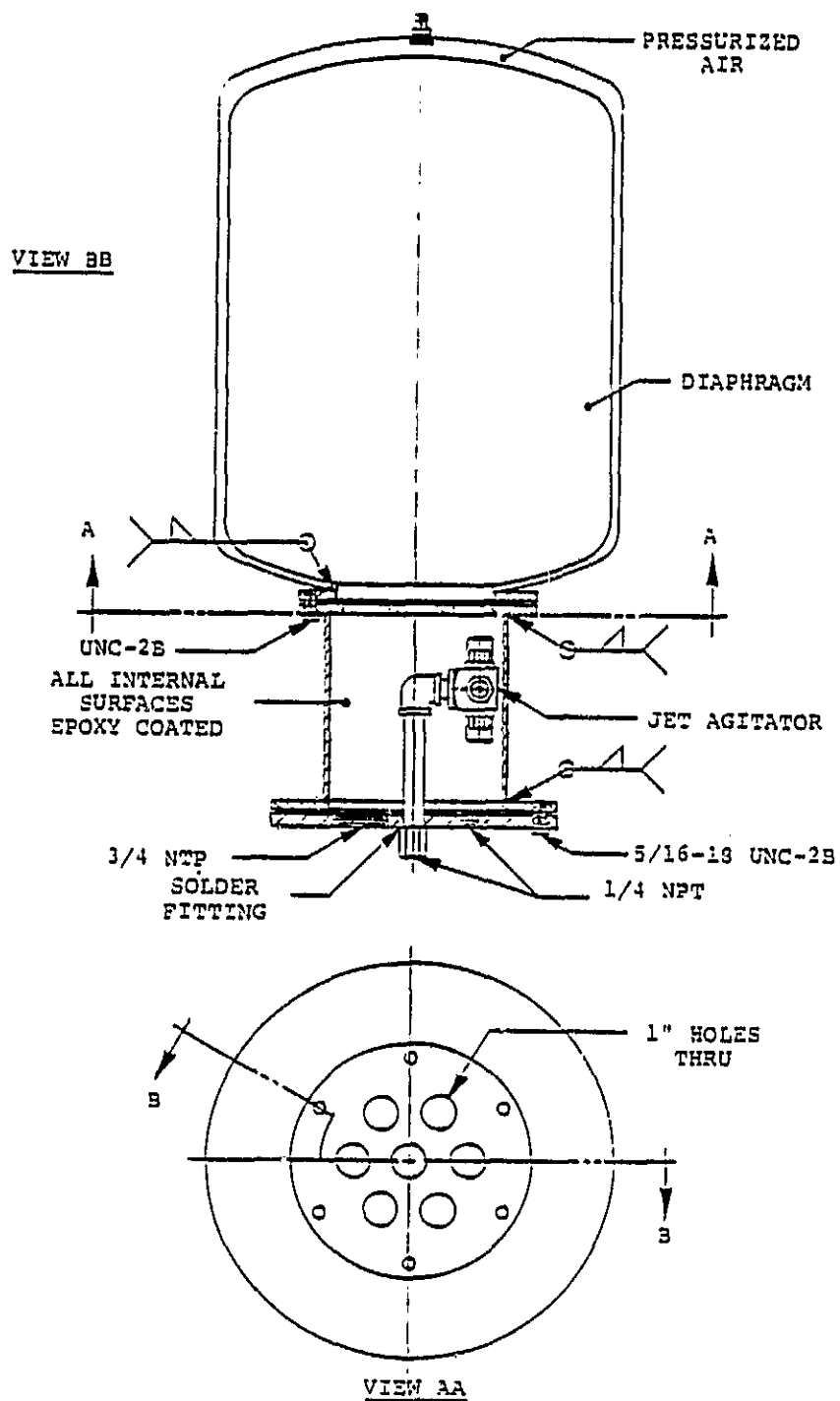
WIRING
DIAGRAM
FIGURE 16

SUCK
POWER
CUT CUT



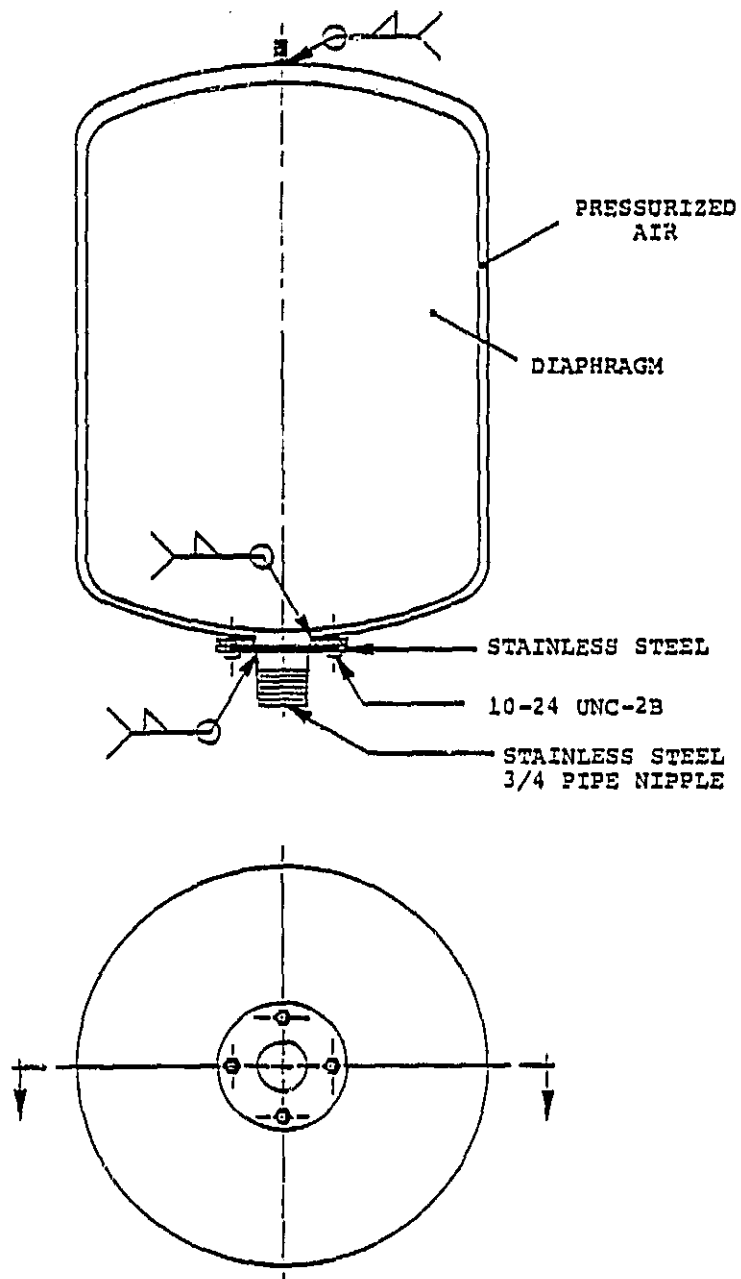
WIRING DIAGRAM

FIGURE 17

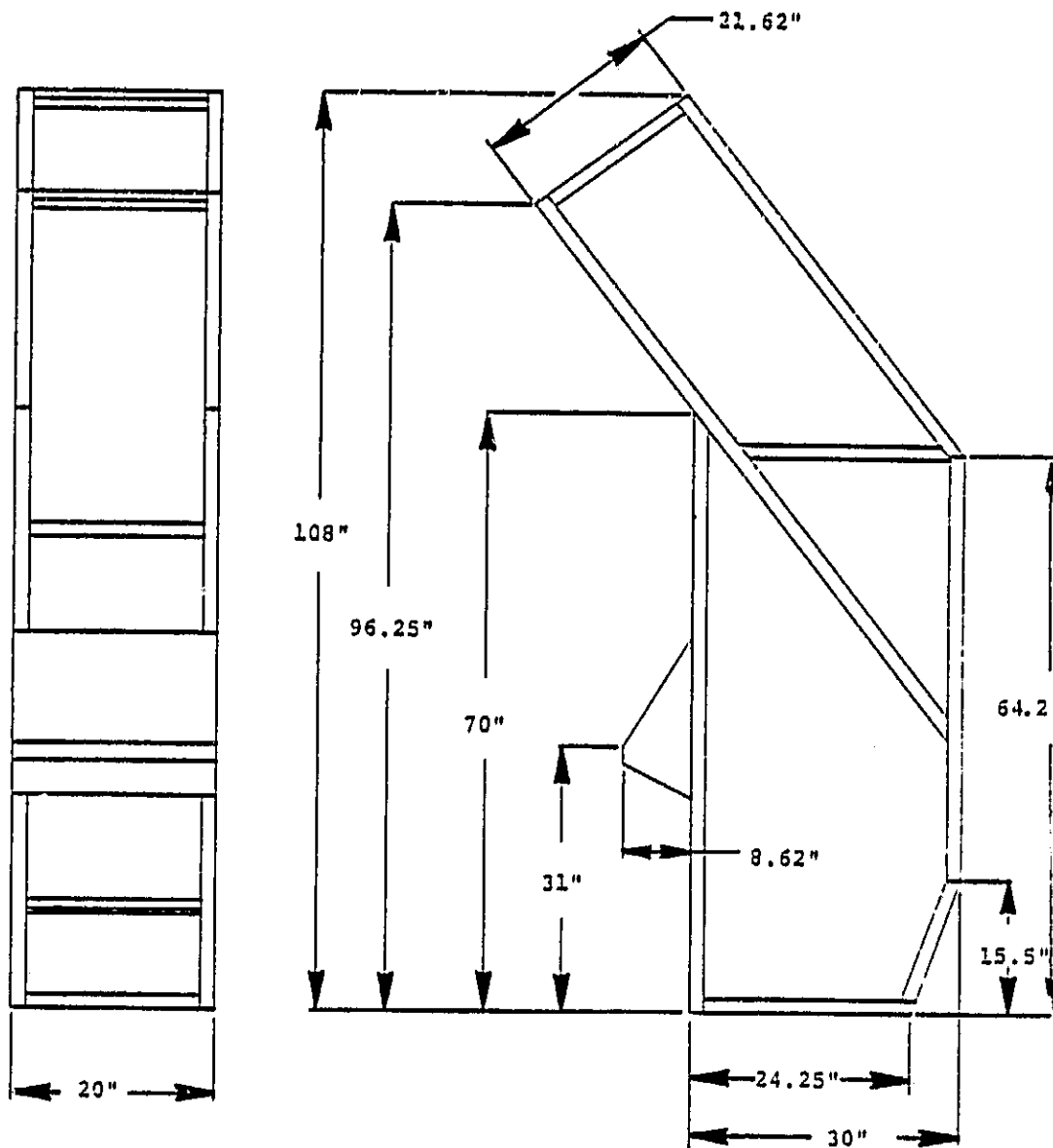


MIXING TANK

FIGURE 18



WASTE TANK
FIGURE 19



PROTOTYPE PWWRS/SUHCF
FRAME

FIGURE 20

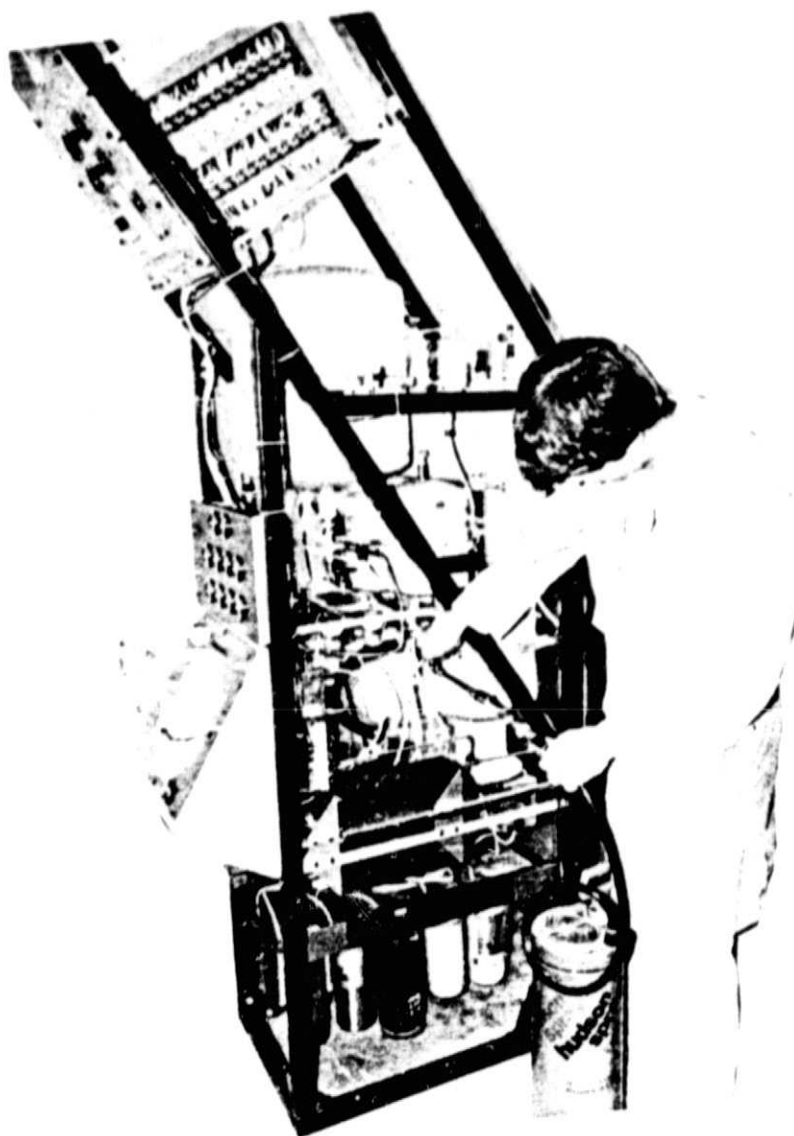
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BLACK AND WHITE PHOTOGRAPH



DEMONSTRATION HAND WASHING
FWWWRS/SUHC F PROTOTYPE

FIGURE 21

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH



PWWRS/SUHCF
RECHARGING SYSTEM

Figure 22

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH



REAR VIEW
PWWRS/SUHCF

SAMPLING VALVES AT TOP
MIXING TANK AND DEAREATOR

FIGURE 23

MODEL: CP162 TRIPLE OUTPUT

EDITION NO.2

INFORMATION CONTAINED:

1. SCHEMATIC
2. PARTS LIST
3. SPECIFICATIONS
4. OUTLINE AND MOUNTING
5. GENERAL USER INFORMATION



APPLICATION DATA SHEET

AC CONNECTION TABLE

INPUT 50-60HZ	JUMPER	APPLY AC	FUSE
115 VAC	1 1 3 . 2 1 4	1 1 4	3.0 A
230 VAC	2 1 3	1 1 4	1.5 A

OUTPUT RATING CHART

VOLTS	AMPS		OVP
	STEADY	SURGE	
+ 5 0	3 0	_____	6.2 ± 4 VDC
- 5 0	0 6	_____	6.2 ± 4 VDC
+ 24 0	5 0	6.0 _____	

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A.C. INPUT:

115/230 VAC ± 10% 47-400 HZ

D.C. OUTPUT:

(DERATE OUTPUT CURRENT 10% FOR 50HZ OPERATION)
SEE OUTPUT RATING CHART, ADJUSTMENT RANGE, ± 5% MINIMUM.

OUTPUT RIPPLE:

2 TO 15V OUTPUTS 5.0 mV PK-PK MAXIMUM.
20 TO 200V OUTPUTS 5.0 mV PK-PK MAXIMUM.

LINE REGULATION:

± 0.5% FOR A 10% LINE CHANGE.

LOAD REGULATION:

± 0.5% FOR A 50% LOAD CHANGE.

TRANSIENT RESPONSE:

50 μSECONDS FOR A 50% LOAD CHANGE.

STABILITY:

± 0.3% FOR 24 HOURS AFTER WARM UP.

TEMPERATURE RATING:

0° TO 50°C FULL RATED, DERATE LINEARLY TO 40% AT 70°C.

TEMP COEFFICIENT:

± 0.03% / °C MAXIMUM, 0.010% / °C TYPICAL.

VIBRATION:

PER MIL-STD-883C, METHOD 214, PROCEDURE X.

SHOCK:

PER MIL-STD-883C, METHOD 216, PROCEDURE V.

SHORT CIRCUIT:

AUTOMATIC CURRENT LIMIT/FOLDBACK.

OVERLOAD PROTECTION:

CONVECTION COOLING IS ADEQUATE WHERE NON RESTRICTED AIR FLOW IS AVAILABLE. WHEN OPERATING IN A CONFINED AREA, MOVING AIR OR CONDUCTION COOLING IS RECOMMENDED.

COOLING:

OVERVOLTAGE PROTECTION: SEE OUTPUT RATING CHART.

REMOTE SENSING:

LEAD PROTECTION BUILT-IN.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

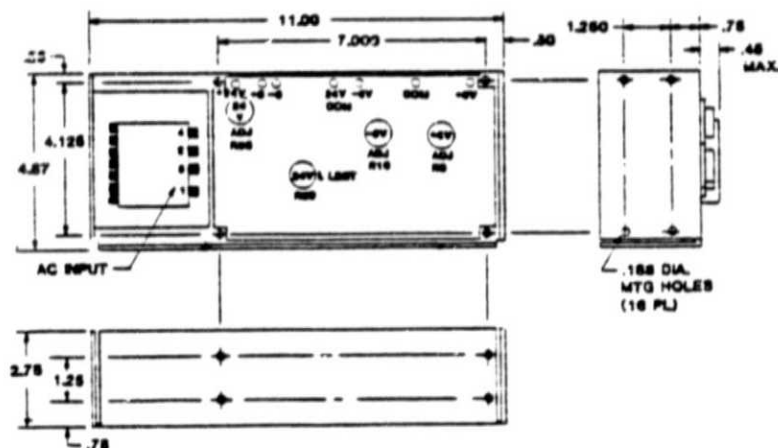
IMPORTANT:

THIS POWER SUPPLY FEATURES REMOTE SENSING CAPABILITY. REMOTE SENSING TERMINALS ARE PROVIDED FOR HOOK-UP WHEN USED IN APPLICATIONS UTILIZING THIS FEATURE.

WHEN NOT USING REMOTE SENSING, OR WHEN TESTING THE UNIT TO ITS SPECIFICATIONS, THE REMOTE SENSING TERMINALS SHOULD BE CONNECTED TO THEIR RESPECTIVE OUTPUT TERMINALS AS FOLLOWS:

+S TO + OUT

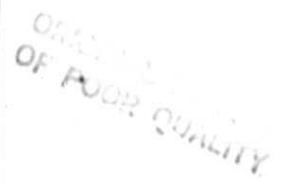
-S TO - OUT



CP162 CHASSIS
UNIT WEIGHT 9 LBS

CP162 CHASSIS

FIGURE 24

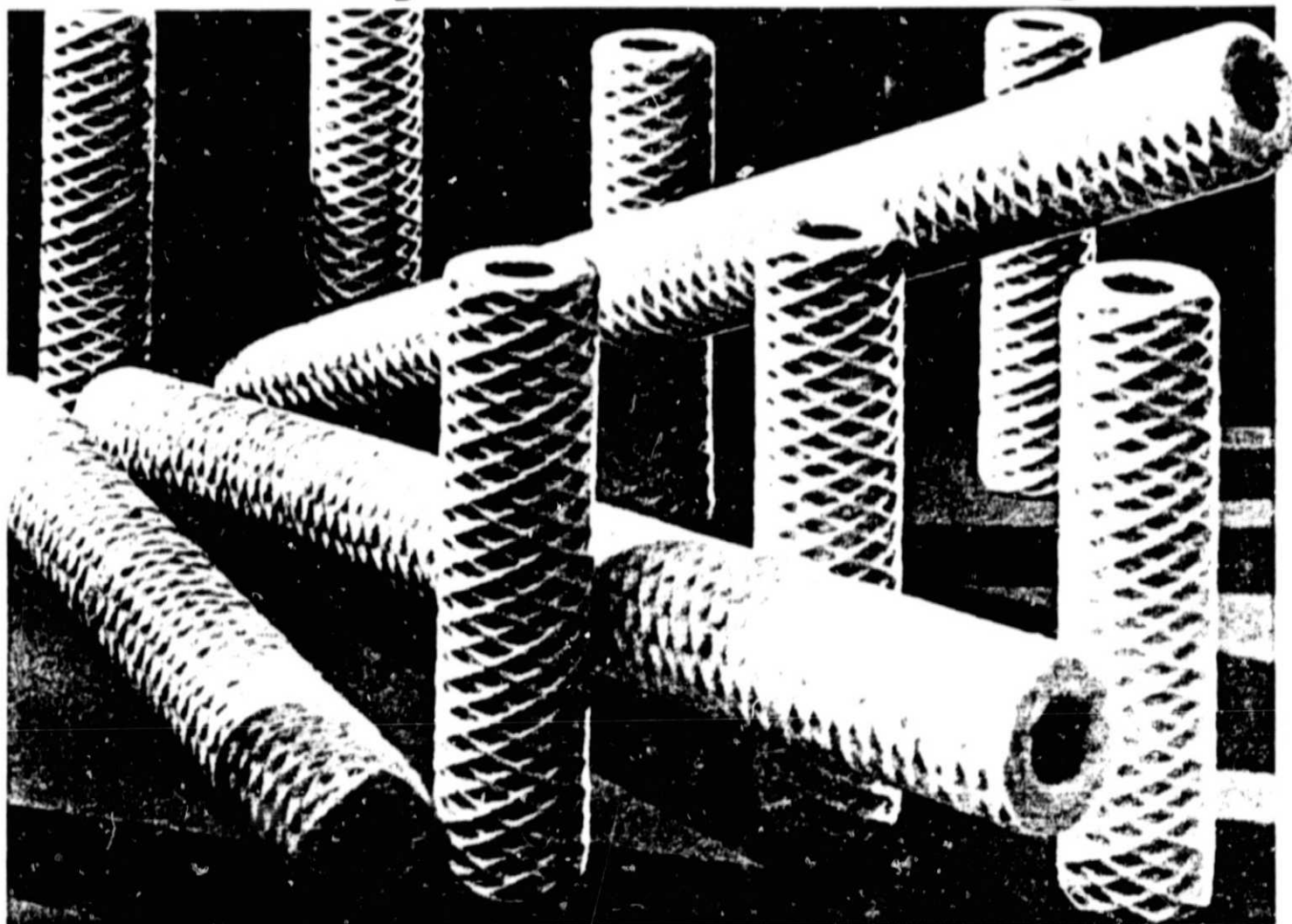


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- INSERT A-1 IN STUNTING ELECTRON SOURCE JAW.
- SELECT A TEST TO BE INSTALLED IN FINAL TEST
- ALL VOLTAGES REF TO COMMON DUT PLTS
- VOLTAGE MEASUREMENTS @ HIS VAC INPUT
- FULL LOAD ON OUTPUT

NOTES: UNDER OTHERWISE SPECIFIED

Micro-Wynd II® Filter Cartridges

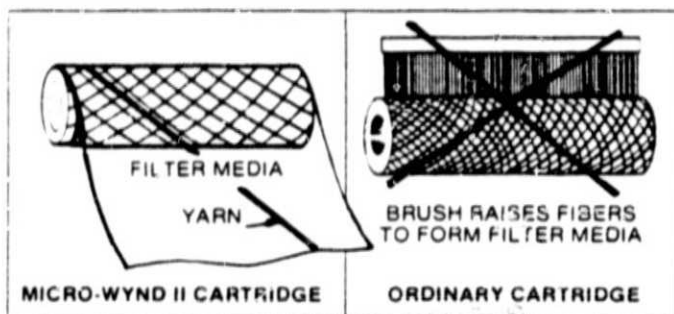


EFFICIENT MICRON RATINGS

Micro-Wynd II filter cartridge micron ratings are accomplished by constantly maintaining the same matrix winding pitch while varying the quantity and physical characteristics of the filter media material being inserted. Filter media is specially processed by AMF Cuno to strict fiber length requirements. As a result, media fibers bridge at least three diamond openings near the outer surface . . . as the diameter decreases the media fibers are anchored in place by three or more diamond windings. The combination of quantity and positive anchoring of filter media is your assurance of accurate ratings in all density cartridges. With ordinary cartridges the micron rating is changed by varying the winding pitch to open the cartridge as the density ratings become coarser . . . thereby presenting difficulties in securing short "teased" filter fibers adequately in place.

Micro-Wynd II filter cartridges are produced with AMF Cuno's exclusive patented process of combining two *separate* materials simultaneously on a common core. The filter media is applied in blanket form while the matrix yarn or twine is wound spirally under predetermined tension to bind the media blanket securely in position. This winding pattern creates large, diamond shaped chambers to dramatically improve flow performance. At the same time the separately inserted filter media blanket encloses these flow chambers to provide a positive barrier against the passage of micronic size particles. With ordinary cartridges a single strand of yarn is "teased" during the winding operation to produce a filtering media . . . successive windings are relied upon to hold these random brushed up fibers in place.

CONSTRUCTION WITH A DIFFERENCE



OPERATING DATA

Micro-Wynd II filter cartridges are suitable for temperature ratings up to 250°F depending upon material's selected. (Refer to individual cartridges for actual rating.) Where a high initial pressure drop can be tolerated, flow rate will be increased, however, this practice tends to reduce cartridge life. While the cartridges are capable of withstanding a differential pressure of 80 psi, it is recommended that for maximum operating economy they be replaced at 25 to 35 psi.

ORIGINAL PAGE
BLACK AND WHITE PHOTOGRAPH
SPECIAL CONFIGURATIONS AVAILABLE

MICRO-WYND II FILTER CARTRIDGES

SPECIFICATIONS/LENGTHS



METAL SPACER

316 S.S. — Part #37110-32

COMMERCIAL-FILTERITE REPLACEMENTS — (9 1/8" -20" and 30" nominal lengths) — for single length cartridges, the AMF Cuno 9 1/8" length cartridge can be used. If single length Micro-Wynd II filter cartridges are stacked in these competitive housings, it is advisable to use metal spacers between cartridges to compensate for the 1/8" difference in cartridge length. The spacer also acts as a sealing device to prevent bypass . . . available in 316 stainless steel. Order separately.

EXTENDED
CORE ADAPTOR



316 S.S. — Part #53406-32

EXTENDED CORE CARTRIDGES — for replacement of these cartridges, AMF Cuno can supply Micro-Wynd II cartridges with extended core adaptors. Or adaptors, as illustrated can be supplied separately. The adaptors quickly insert into the end of Micro-Wynd II filter cartridges and are removable and can be reused. Order cartridges with extended cores, or, order regular cartridges with separate adaptors.

MULTIPLE LENGTH CARTRIDGES

To indicate multiple length cartridges add the following appropriate suffix to the cartridge letter designation.

- 2 (double length cartridge — 19 1/8")
- 2x (double length cartridge — 20")
- 3 (triple length cartridge — 29 1/8")
- 3x (triple length cartridge — 30")

*Use these suffix numbers for Commercial, Filterite or other competitive wound cartridge replacements.

Thus, D-CCFY-3 identifies an all cotton Micro-Wynd II filter cartridge with tinned steel core, 1 micron rating and triple length construction (29 1/8").

For voile covered core insert the letter "V" prior to the last letter in the code. Thus in the example given the designation would be D-CCFVY-3.

For extended core cartridges, drop the prefix letter D in the letter code designation and substitute with an S as follows:

D-XXXX Micro-Wynd II (no extended core)

S-XXXX Micro-Wynd II (316 stainless extended core)

CARTRIDGE SELECTION

1. POLYPROPYLENE MEDIA — POLYPROPYLENE MATRIX . . . Cartridge for applications involving strong acid, concentrated alkalis, strong oxidizing and reducing agents and other chemicals in aqueous solutions which would react with cotton or viscose. Not suitable for hydrocarbon type solvents such as hexane, naphtha, petroleum ether, etc. Generally rated for 175°F with metal cores.

Micron Rating	Tinned Steel Core	304 Stainless Steel Core	316 Stainless Steel Core	Polypropylene Core — 140°F
1	D-PPFY	D-PPSY	D-PPTY	D-PPPY
3	D-PPFA	D-PPSA	D-PPTA	D-PPPA
5	D-PPFB	D-FPSB	D-PPTB	D-PPPB
10	D-PPFC	D-PPSC	D-PPTC	D-PPPC
25	D-PPFF	D-PPSF	D-PPTF	D-PPPF
50	D-PPFL	D-PPSL	D-PPTL	D-PPPL
75	D-PPFQ	D-PPSQ	D-PPTQ	D-PPPQ
100	D-PPFV	D-PPSV	D-PPTV	D-PPPV
350	D-PPFW	D-PPSW	D-PPTW	D-PPPW

2. COTTON MEDIA — COTTON MATRIX . . . Application similar to No. 1 except slightly better chemical resistance to acids and alkalis. Ideal for water, alcohol and other polar type liquids. Cotton is bleached and washed with FDA approved materials to remove all wax and lubricants to permit acceptability on potable water, beverages and food products. Rated for 250°F on liquids . . . 210°F on gases (dry).

1	D-CCFY	D-CCSY	D-CCTY	D-CCPY
3	D-CCFA	D-CCSA	D-CCTA	D-CCPA
5	D-CCFB	D-CCSB	D-CCTB	D-CCPB
10	D-CCFC	D-CCSC	D-CCTC	D-CCPC
25	D-CCFF	D-CCSF	D-CCTF	D-CCPF
50	D-CCFL	D-CCSL	D-CCTL	D-CCPL
75	D-CCFQ	D-CCSQ	D-CCTQ	D-CCPQ
100	D-CCFV	D-CCSV	D-CCTV	D-CCPV
350	D-CCFW	D-CCSW	D-CCTW	D-CCPW

Note: All extended cores will be 316 stainless steel regardless of cartridge core material.

NOTES:

- A. Polypropylene core limited to 140°F operating temperature.
- B. Polypropylene core necessary for high acid conditions.
- C. Stainless steel core suitable for moderate or low acid conditions.
- D. Tinned steel core suitable for neutral aqueous solutions and many organic (non-aqueous) chemicals.
- E. The effects of temperature, concentration, aeration and other factors may cause a definite change in the compatibility of the fiber media involved. Whenever the slightest doubt exists about temperature compatibility, simple testing can confirm fiber selection.

Activated Carbon Cartridge

- HEAT SEALED "NO MESS" CARBON CARTRIDGE
- BUILT-IN 5 MICRON PREFILTERS AND POSTFILTER
- INTERCHANGEABLE IN MANY EXISTING FILTER HOUSINGS

AMF Cuno Activated Carbon Cartridges remove chlorine, color, odors and turbidity from aqueous and organic liquids. Since all materials are non-toxic and of food grade quality, the cartridges are also useable on drinking water and potable liquids. The easy-to-change throwaway cartridge contains about 35 cu. in. of premium quality hard granular activated carbon. Millions of active surfaces adsorb dissolved gases and organics, and removes chlorine while prefilters provide 5 micron filtration.

CARTRIDGE CONSTRUCTION

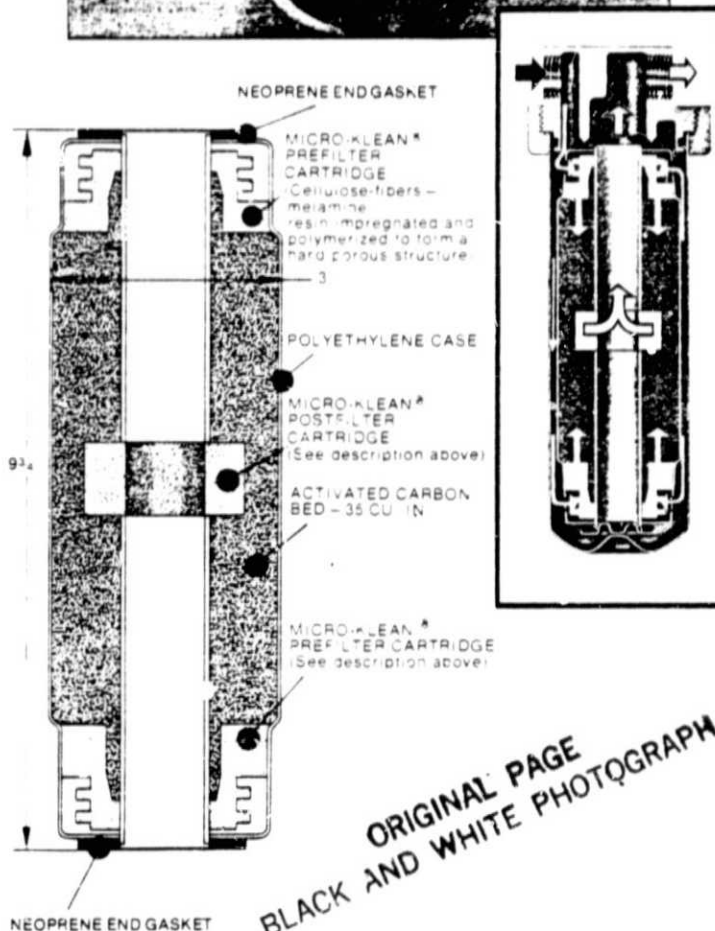
Activated carbon, prefilters and postfilter are all contained in a heat sealed polyethylene case. This unitized cartridge construction eliminates the mess associated with handling carbon. The 5 micron Micro-Klean prefilter cartridges remove dirt, rust and other sediment in the liquid. The 5 micron Micro Klean postfilter prevents the activated carbon from escaping.

AMF Cuno Activated Carbon Cartridges can be used in either single cartridge filter housings or stacked in multiple cartridge housings (end gaskets provide the necessary seal in either arrangement).

CARTRIDGE OPERATING DATA

The AMF Cuno Activated Carbon Cartridge is capable of supplying 3 gpm of water at 6 psi differential pressure. Since prolonged contact time can increase the adsorption efficiency, it may be desirable to maintain a flow rate to 1 or 2 gpm per cartridge or less on some applications. When the carbon is spent, the taste, odor, etc., will return in the effluent and indicate a required change of cartridges. Should liquid pressure fall off, then the prefilter cartridges are being prematurely clogged with excess sediment and a larger Micro-Klean 11 filter cartridge unit should be installed ahead of the carbon cartridge filter.

Cartridge life will vary in proportion to the amount of dissolved gases, etc., in the liquid. Other factors influencing cartridge life will be flow rate, water temperature, pH level, and whether operating on continuous or intermittent service.



ORIGINAL PAGE
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Cartridge Catalog No. 46285-01
Temperature Limit 100°F

LIQUID FERRIC CHLORIDE

Properties

Pennwalt liquid ferric chloride is a dark brown solution of FeCl_3 in water. The concentration of the solution shipped at a given time is determined by two factors. First, of course, the FeCl_3 content of the solution should be as high as possible, to keep the transportation cost per unit of FeCl_3 as low as possible. Second, crystallization of the ferric chloride due to low temperatures during transit or storage is troublesome, and concentrations are limited by the ambient temperatures prevailing at the time. For this reason, the shipping strength of Pennwalt liquid ferric chloride solutions is varied from 45% in summer to 38% in winter.

Shipping Containers

Pennwalt liquid ferric chloride is shipped in rubber-lined tank cars and tank trucks, in the quantities shown in Table 2.

TABLE 1—PROPERTIES OF LIQUID FERRIC CHLORIDE

Ferric Chloride Content*	38% to 45%	
Molecular Weight	162.22	
Form and Color	Dark brown liquid	
Specific Gravity	1.4 to 1.5	
Average Crystallization Temperature: 39%	7°F	-13.9°C
40	14	-10
41	21	-6.1
42	28	-2.2
43	35	1.7
44	42	5.6
45	48	8.9
46	55	12.8

*Concentration is adjusted seasonally to avoid crystallization during transit. During periods of sustained, severely cold weather, concentration may be lowered to 38%.

TABLE 2—PENNWALT LIQUID FERRIC CHLORIDE SHIPMENTS

Shipping Container	Volume	Approx. Shipping Weight
Tank Cars, Rubber Lined	4,000 gal.	23 tons
	6,000 gal.	34 tons
	8,000 gal.	46 tons
	10,000 gal.	57 tons
	18,000 gal.	100 tons
Tank Trucks, Rubber Lined	Quantity dependent upon applicable state truck weight regulations.	

SAFETY AND FIRST AID

Safety. Great care should be taken to avoid the contact of anhydrous ferric chloride with any part of the body, and especially with the eyes. The moisture present in the eyes or on the skin is enough to release sufficient heat to cause severe damage. Ferric chloride solutions should be handled with the same care as acid solutions, since they can cause burns similar to those caused by acids. They are also injurious to clothing and cause difficult-to-remove stains. Personnel handling anhydrous ferric chloride or ferric chloride solutions should wear overalls, rubber apron, rubber gloves and chemical goggles. Floors, walls and equipment which are subject to splashing should be protected with corrosion-resistant paint or rubber mats.

First Aid. If *anhydrous ferric chloride* comes in contact with the skin or clothing, *do not* wash immediately with water. Severe burns can result from the great amounts of heat produced when anhydrous ferric chloride is dissolved. Wipe off the excess ferric chloride first with a cloth, and then wash with large amounts of water.

If *liquid ferric chloride* comes in contact with the skin or clothing, wash it off immediately and thoroughly with water.

In cases of splashes of liquid ferric chloride in the eyes, flush immediately and thoroughly with large amounts of water for at least 15 minutes and then rinse with a weak solution of sodium bicarbonate or boric acid. Consult a physician immediately.